COMPARISON OF ACHIEVEMENT IN TYPEWRITING AND INTEREST AS MEASURED BY AN OCCUPATIONAL INTEREST INVENTORY

BY

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STATEMENT OF THE PROBLEM

Introduction

Just what factors contribute to attainment of typewriting skill are not definitely known, but a number of attempts have been made to determine what they are, with varying degrees of success. White[1] classifies the traits that have been the subject of such studies, as falling into four categories:

1. Mental traits or native capacities, such as general intelligence.
2. Mental skills, such as reading, code learning, and substitution.
3. Motor abilities, such as tapping speed, eye-hand coordination, and reaction time.
4. Personal factors, such as age, school-grade placement, vocational interests, and purpose in learning to typewrite.

Some studies have reported that intelligence and typewriting ability are closely related; but others have found the relationship to be low. Puckett[2] concluded from a study of 20 cases that:

> The greater mental capacity a student has, the better work he can do in typing . . . . If this experiment, carried on, of course on a small scale, can be used as a basis of facts, it has proved that grades given in typewriting have a close correlation with I. Q. and are representative of the students' ability and are pretty well on a level with the grades given in the other subjects in the course of study.

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[1]Bruce White, "Prediction of Typewriting Success," The Journal of Business Education, X (April, 1935), p. 15.

[2]Cecil Puckett, "The Rank of the Inferior Student in Typewriting," The Balance Sheet (May, 1930), p, 262.

Stedman,[3] however, found very low correlation between intelligence quotients and achievement in typewriting as measured by net speed scores in a study of 3,159 children. The coefficient between intelligence and accuracy was .168 ± .116, and between intelligence and speed, .244 ± .112. In a further study of 75 of these cases, she obtained slightly higher coefficients between accuracy in typewriting and arithmetic (.396 ± .096); between speed in typewriting and arithmetic (.318 ± .101); and between accuracy in typewriting and spelling (.324 ± .10).

Davis[4] made a survey of 1,000 cases in St. Louis high schools in an endeavor to determine what factors are conducive to successful typewriting achievement. Correlations were computed between typewriting scores and chronological age (-.069), mental age (.046), intelligence quotient (.132), and rank in the eighth grade (.137). He reported that "all that can be said is that these criteria do not predict success in typewriting."

Ackerson[5] made a study of the relationship between the results of a series of psychological tests and a series of criterion measures of proficiency in typewriting for 304 pupils. The psychological tests used were the Army Alpha, I. E. R. Clerical Test, three tests from the Woodworth-Mills series (digit cancellation, number group checking, and form

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[3]Melissa Branson Stedman, "A Study of the Possibility of Prognosis of School Success in Typewriting," Journal of Applied Psychology, XIII (October, 1929), p. 509.

[4]H. H. Davis, "Measurement in Commercial Education in the St. Louis Schools," Iowa Research Studies in Commercial Education, I (1926), p. 43.

[5]Luton Ackerson, "A Correlational Analysis of Proficiency in Typing," Iowa Research Studies in Commercial Education, I (1926), pp. 88-95.

substitution), and the Otis Advanced Examination. The four criterion measures of proficiency in typewriting were: speed, accuracy, combined speed and accuracy, and the average of the six semester final grades in typing classes during the three-year course. He concluded that mental ability does not seem to insure typewriting ability; the correlation of intelligence with speed was .12 ± .06, and with accuracy -.02 ± .06.

Cobb[6] made a study of 179 pupils to determine the relationship between speed and accuracy attained by pupils in their first year of typewriting and their scores in speed and comprehension in reading. The highest coefficient obtained was .437 ± .135 for reading speed and gross rate in typewriting. She concluded:

> On the basis of these findings, it is not recommended that selection of pupils for typewriting classes be based on reading ability.

Overholtzer[7] studied the possibilities of selecting pupils with typing ability by administering tests involving substitution, tapping, immediate memory, concentration and accuracy, and following directions. He obtained the following coefficients between typewriting scores and the various test scores:

Trait Correlated with Typewriting	r
Following directions	.08
Tapping	.26
Concentration and accuracy	.29
Immediate memory	.30
Substitution	.48

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[6] Emma Katherine Cobb, "The Relation Between Certain Phases of Reading Ability and Speed and Accuracy in Typewriting," Master's Thesis, University of North Carolina, Greensboro, 1944.

[7] John M. Overholtzer, "A Study of the Possibilities of Predicting Typing Ability," Master's Thesis, University of Southern California, 1928.

Other studies of typewriting, involving measures of tapping,[8] substitution,[9] and cancellation,[10] have failed to establish a high degree of relationship between typewriting achievement and the measures used. Lackey[11] gave the MacQuarrie Test of Mechanical Ability to 192 pupils, and obtained a coefficient of .301 ± .044 between total scores on the MacQuarrie Test and gross typewriting strokes. She concluded that:

> Motor ability seems to be fairly independent of speed in typewriting . . . .
>
> There are other factors in the process of acquiring speed in typewriting in addition to the abilities measured by current intelligence and motor tests. Until it is known just what the factors are in acquiring speed in typewriting, it will be difficult to find a measure for such an important trait.

Lessenberry[12] questions the appropriateness of the measure commonly used in studies of typewriting achievement (i.e., net words from straight-copy material), particularly in relation to intelligence:

> In general, those phases of typing that call for organization of materials or work plans, rather than the simple straight-copy skill, may offer a more reliable measure of typing achievement with which to correlate I. Q. Intelligence may not be a necessary factor in learning to type, but it is a necessary factor in using the developed typing skill . . . .

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[8] William F. Book, "Voluntary Motor Ability of the World's Champion Typists," Journal of Applied Psychology, VII (September, 1924), pp. 283-308.

[9] Minnie A. Vavra, "Success in Typewriting," Journal of Educational Psychology, XVI (October, 1925), pp. 487-492.

[10] Luton Ackerson, op. cit., p. 89.

[11] Florence Woodward Lackey, "A Study of the Prognostic Value of the MacQuarrie Test for Mechanical Ability in First-Year Typewriting Speed," Master's Thesis, Oklahoma Agricultural and Mechanical College, 1938.

[12] D. D. Lessenberry, Methods of Teaching Typewriting, Monograph No. 36 (Cincinnati: South-Western Publishing Co., 1937), p. 16.

> A summary of attempts to find a reliable means of predicting ability to learn typewriting must inevitably conclude with the statement that no single measure or combination of measures has been proved reliable. Research must be continued. Perhaps the first step will be the discovery of the factors that must be present for successful typing . . . . Then, too, much work should be done on the problem of interest, for this is probably the factor that must be present for successful learning.

White[13] used gross speed, per cent of errors, and net speed as measures of typewriting achievement in a study of students at the University of Washington. He obtained a coefficient of .38 ± .04 between general intelligence and gross speed in typewriting; .31 ± .04 between intelligence and net speed; and .14 ± .04 between intelligence and per cent of errors.

The highest coefficient obtained with the Whipple Reading Test and the three types of typewriting scores was .41 ± .06 for net reading scores and net typewriting scores.

In the fields of motor ability, White applied three tests--simple tapping, single response serial action, and multiple response serial action--and correlated the results with typewriting speed. The coefficients varied from zero to .44 ± .08 (gross typing speed and speed on single response serial action).

For net typewriting scores and scores on the Strong Vocational Interest Blanks (scored by the "Office Clerk" key) White obtained a coefficient of only .01 ± .09. In presenting conclusions from the

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[13]Bruce White, "Prediction of Typewriting Success," The Journal of Business Education, X (April, 1935), p. 15.

findings of his study, he made the following comment concerning interest and typewriting:

> . . . it appears that intelligence, reading skill, age and performance on serial response motor tests are significant factors in typewriting achievement. While no statistical evidence was furnished on the question of interest, the fact that those individuals who dropped out of the classes, presumably because of lack of interest, were always among those who were making the least progress, suggests that there is a relationship here also. It seems highly probable that a more valid measure of interest would show a significant relationship with typewriting achievement . . .

The following statements concerning studies of pupil interests are presented because of their bearing on the present study of interest and achievement in typewriting.

King[14] reviewed the literature on interest up to 1932 and concluded "that interests possess a considerable degree of permanency, that they can be evaluated quantitatively, and that they can be utilized as effective factors of prognosis or guidance."

Concerning his own evaluation of mental and interest tests, he stated:

> Interest tests are inferior to mental tests as indices of ability, but show definite value for differential prognosis . . . that is, in segregating certain tests which carry high weights for one subject with low weights for the other subjects.

Kelley's and Wyman's[15] studies of intellectual, social, and activity

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[14]Leo Hamilton King, Mental and Interest Tests, Their Evaluation and Comparative Effectiveness as Factors of Prognosis in Secondary Education (New York: Bureau of Publications, Teachers College, Columbia University, 1931), pp. 23, 114.

[15]Reported by Leo Hamilton King in Mental and Interest Tests, Their Evaluation and Comparative Effectiveness as Factors of Prognosis in Secondary Education (New York: Bureau of Publications, Teachers College, Columbia University, 1931), p. 19.

interests substantiated King's finding that "interest is not as predictive of achievement as intelligence."

Thorndike,[16] from his studies and from re-examination of researches of others maintained that "there is a close relation between the order of interests and abilities, that interests are rather stable features of an individual's character and are indicative, either as cause or effect or both, of abilities." Commins and Shanks[17] reported that "ability owes more to interest than interest to ability."

Fryer[18] reported investigations concerning the permanency of interests:

> In general, it may be said that for a period of one year, whether the subjects are in college, high school, or elementary school, there can be expected, on the average, about a fifty per cent permanence of specific vocational interests . . .
>
> Specific vocational interests are likely to change in a year's time. Vocational interest trends go through a gradual process of change and are likely to be different in later adolescence to what they are in early childhood. When all this has been said, however, there is permanence or stability of interests, as indicated in every study, to a surprising degree.

Research concerning the relationship of abilities and interests, according to Fryer, suggests the conclusion that:

> Interests and abilities are different qualities in mental life. Neither one is dependent upon the other. Neither can be predicted from the other. This is valuable practical knowledge for the personnel and guidance office. However, there is yet the relation between interests and achievement or success to be determined.

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[16] Ibid., p. 17

[17] Ibid., p. 19

[18] Douglas Fryer, The Measurement of Interests in Relation to Human Adjustment (New York: Henry Holt and Co., 1931), pp. 158, 184.

Di Michael[19] investigated interests as the basis of vocational choice and concluded that interest tests are of less value than ability tests in prognosis, but interest is nevertheless important in vocational guidance.

Interests have been classified as "estimated," when the likes or dislikes are named by the individual; and "inventoried," when they are designated by answering items in an interest inventory. According to Fryer,[20] it is generally agreed that inventoried interests are a more valid measure of subjective interest. Moffie[21] made a study of the validity of self-estimated interests in occupations and concluded:

> It appears to the writer that the measured score would be more indicative of actual trends in interest, but that an estimated score should not be completely disregarded.

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[19] S. G. Di Michael, "Using Interests as the Basis of Vocational Choice," Occupations, XX (February, 1942), pp. 270-275.

[20] Douglas Fryer, op. cit., p. 203.

[21] D. J. Moffie, "Validity of Self-Estimated Interests in Occupations," Journal of Applied Psychology, XXVI (October, 1942), pp. 606-613.

Purpose of This Study

On the basis of the opinions of the investigators in the field of interest, that interests have a considerable degree of permanency and can be evaluated quantitatively, the suggestion that interest might be a determinant in successful learning of typewriting gave rise to the present endeavor to apply a measure of "interest" to typewriting pupils, in an attempt to discover the relationship between the measured interests and typewriting achievement.

The Interest Test

Publishers' listings of tests show relatively few tests on interest. In addition to the bibliographies contained in the professional literature which has been reviewed on the preceding pages, the Education Index and the Business Education Index were consulted in the pursuit of the present study, for references on interest tests and published studies on interest. Since inventoried tests are recommended as being most valid for measuring subjective interests,[22] a choice of instrument in that category was sought. The Occupational Interest Inventory--Intermediate, Form A, by Edwin A. Lee and Louis P. Thorpe,[23] seemed appropriate to the purpose of this study because, according to its

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[22] Douglas Fryer, op. cit., p. 203.

[23] Edwin A. Lee and Louis P. Thorpe, "Occupational Interest Inventory--Intermediate, Form A" (Los Angeles: California Test Bureau, 1944), Manual of Directions, p. 1.

authors, "The Inventory is to be used as a means of finding and using the interests of the individual as they contribute to educational and vocational guidance. It is to aid in discovering the basic occupational interests a person in high school possesses so that he may be trained in a calling for which he is fitted."

The reliability of the Inventory, in a repetition of the test to 100 ninth-grade pupils, yielded coefficients of .80 to .92. The authors point out that it is difficult "to establish the validity of an occupational inventory by purely objective criteria, as the prestige and security associated with certain occupations will cause favorable reactions in the choice of interests, which change when the nature of the tasks, their advantages and disadvantages, are understood. Certain factors may increase or decrease the validity of occupational inventories, according to the way they are used in developing such instruments." The factors considered by the authors in establishing the validity of the Inventory were: (1) selection of items, (2) design or description of items, (3) balance of items, (4) presentation of items. A copy of the Occupational Interest Inventory is included in the Appendix.

Three occupational dimensions are represented in the Interest Inventory: (1) fields of interests, (2) types of interests, and (3) level of interests. Part I includes fields of interests and types of interests, and Part II includes level of interests. The authors describe the structure of these as follows:

1. Fields of Interests. An interpretation of Inventory findings first identifies the individual's occupational interests within six major fields: A. Personal-Social; B. Natural;

C. Mechanical; D. Business; E. the Arts; and F. the Sciences. Occupational interests vary in scope from a specific part of one of these six fields to a variety of interests in two or more fields. For example, interests in the mechanical field may be accompanied by similar interests in science and thus reveal a potential inventor, mechanical engineer, or machinist. A combination of interests in the natural and the arts fields may reveal a potential landscape artist.

2. Types of Interests. This Inventory also reveals certain types of interests which the individual possesses. The objective of this feature is to determine whether the individual is most interested in (No. 1) verbal activities which involve facility in the use of language, in (No. 2) manipulative activities in which he works with materials, or in (No. 3) activities which require computational ability and skill. This unique feature should make possible more exact counseling and guidance in the schools and more accurate selection and placement in the world of work.

3. Level of Interests. This Inventory also identifies the levels on which an individual's basic interests exist. The results indicate whether these interests are associated with routine tasks, with tasks requiring considerable skill, or with tasks requiring expert knowledge, skill, and judgment and which often involve supervisory and administrative activities.

Fields of Interests, Part I of the Inventory, present 240 items associated with six major fields: Personal-Social, Natural, Mechanical, Business, the Arts, the Sciences. There are 40 choices in each field, these 40 choices having been selected to fall into three levels: low, medium, and high. Thus "washing dishes" or "making beds" is on the low level in the Personal-Social field: "playing an instrument in a band or orchestra" is on the high level in the Mechanical field. These 240 items in Part I are arranged in pairs, the pupil being instructed to choose one from each pair.

A letter attached to each item in the Fields of Interests identifies an interest field, A representing Personal-Social, B Natural,

C Mechanical, D Business, E Arts, F Science.

Three interest "types"--Verbal, Manipulative, and Computational--are represented in the 240 items of Part I. Responses are classified by the figures accompanying the code-letters: "1" identifies a Verbal interest; "2" a Manipulative interest; and "3" a Computational interest. Not all items, however, carry a code figure for type of interest--only those which involve one of the three types of interest just named. In the following example, letters A and D indicate the Personal-Social and Business Fields and the figure "2" with D identifies this item as representing a Manipulative interest.[24]

1. A. Deliver groceries or meat to homes.

D.[2] Wrap articles in the shipping department of a store.

Part II of the Inventory contains 30 groups of interest items, with three choices of activities in each group. Examples from Part II are:[25]

1. b. Advise regarding travel plans and sell tickets.
   c. Help people to solve their personal problems.
   a. Sell tickets at movie theaters, plays, or entertainments.

28. a. File letters, bills, or reports in an office.
    f. Study business trends, business costs, and methods of keeping down expenses.
    e. Keep records of production costs and overhead expenses in a factory.

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[24]Edwin A. Lee and Louis P. Thorpe, "Occupational Interest Inventory--Intermediate, Form A" (Los Angeles: California Test Bureau, 1944), p. 2.

[25]Ibid., pp. 10, 11.

The small letters, b, c, a, f, and e, in front of the six choices identify the level of interest of the choices made. The individual taking the test is directed to encircle his preference of the three items in each group.

The initial scoring of the Inventory consists of a numerical count of the letters and figures encircled in each part of the Inventory. In Part I a count of the A's, B's, C's, D's, E's, and F's gives the respective scores in Fields of Interests for (A) Personal-Social, (B) Natural, (C) Mechanical, (D) Business, (E) Art, and (F) Science. A count of the 1's, 2's, and 3's gives the scores in Types of Interests for (1) Verbal, (2) Manipulative, (3) Computational. These scores are then converted into percentile rank by reference to tables of percentile norms given by the authors.[26] Percentile norms for females were used as this study is limited to girls.[27]

The highest possible score for Fields of Interests, Part I, is 40; but the scores for the percentile norms of the different fields vary. For example, the 70 percentile represents a "counted" score of 27-28 for Personal-Social, 18-19 for Natural, 16-17 for Mechanical, 29-30 for Business, 27-28 for Arts, and 22-23 for Science.

The highest possible score for Types of Interests is 21; the 20 percentile norm represents a score of 9-10 for Verbal, 10 for Manipulative, and 7-8 for Computational.

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[26] Edwin A. Lee and Louis P. Thorpe, op. cit., Manual of Directions, p. 8.

[27] See p. 16 for explanation of study having been limited to girls.

In Level of Interests, Part II, the letters a, b, c, d, e, and f are counted and weighted (a + d, times 1; b + e, times 2; c + f, times 3) in scoring the responses, as low, medium, and high. The highest possible score is 100. Tables are provided in the test manual for converting the numerical scores into percentile norms, as in Part I.

Both the numerical scores and the percentiles obtained on the different parts of the Inventory were employed for the various comparisons made in this study.

Typewriting Tests

Three "Competent Typist Tests," issued by the Gregg Publishing Company for the months of September, November, and December of the year 1943, were used in this study to measure achievement in typewriting. Competent Typist Tests are published each month in The Gregg Writer. When the teachers of the classes cooperating in this study were questioned as to whether these materials had been used for testing or practice in their classes, all of them reported that these particular tests had never been used in their classes.

The Competent Typist Tests show the stroke-count and are printed in clear type that is easy to read. This kind and form of test is commonly used in testing typewriting achievement and introduced no new requirement or condition that would make the testing situation unusual for the pupils. Copies of these tests are in the Appendix.

Participating Schools

The subjects of this study were 129 pupils from five schools in North Carolina and Florida: New Hanover High School in Wilmington, North Carolina; Curry High School of the Woman's College in Greensboro, North Carolina; DeLand High School in DeLand, Florida; Jamestown High School in Jamestown, North Carolina; and James A. Gray High School in Winston-Salem, North Carolina.

The New Hanover High School in Wilmington, which is the consolidated high school for the entire county, was, at the time of this study, in the center of army camps and war industries. Its enrollment was composed of children of army personnel, children of shipbuilders, and children of the regular population, including truck farmers and railroad workers. The Curry High School in Greensboro is composed of children of the college faculty of Woman's College in Greensboro, and children of business and industrial workers. Jamestown High School receives its student body in great part from a rural community. The James A. Gray High School in Winston-Salem is made up largely of pupils whose parents are industrial workers employed by the Reynolds Tobacco Company. Deland is located in the center of the citrous-growing industry and has a tourist population. The enrollment of the Deland High School is made up of children of those groups. Hereafter in this report, these five schools will be designated as School 1, School 2, School 3, School 4, and School 5. The numbers do not correspond with the order in which these schools are named above. Identities are therefore not revealed in the coding.

The size of school, length of term, length of class period in typewriting, and number of pupils tested in each of the schools are given in the following tabulation:

School	Size	Length of Term	Length of Class Period	No. of Pupils
1	1,700	9 months	50 minutes	24
2	290	9 months	50 minutes	30
3	200	9 months	55 minutes	20
4	250	9 months	50 minutes	22
5	550	9 months	50 minutes	33

The total number of pupils in the cooperating classes in typewriting was 165, including 34 boys. These 34 cases were excluded from this study because of the small number and because many of the boys were subject to call by the draft for the armed services in the spring of the school year in which the study was conducted. The pupils tested were of the usual high school age, 14 to 18 years, and were in Grades 9, 10, 11, and 12. Their scores on the Terman-McNemar Test of Mental Ability revealed two levels of intelligence: Means of Schools 1, 2, and 3 ranging from 121.6 to 125.04 in intelligence quotients; and means of Schools 4 and 5 being 103.21 and 107.23. The mean I. Q. scores are given in Table I.

TABLE I

RESULTS OF TERMAN-McNEMAR TEST OF MENTAL ABILITY FOR EACH OF THE FIVE SCHOOLS

School	M	
1	125.04	15.14
2	123.15	13.73
3	121.60	12.55
4	107.23	15.48
5	103.21	12.17

Testing Procedures

Soon after school opened in the fall of 1944, the teachers in the five cooperating schools were asked to give the Terman-McNemar Test of Mental Ability to beginning pupils in typewriting. The teachers were requested to follow this testing as soon as it was convenient by the Occupational Interest Inventory--Intermediate, Form A, by Lee and Thorpe. Manuals of Directions for the Terman-McNemar Test of Mental Ability and the Occupational Interest Inventory were sent to each teacher administering the tests, and attention was called to the fact that the parts of the tests must be timed accurately to insure uniform results. Copies of all the tests and manuals of directions are included in the Appendix. All papers were mailed to the investigator for scoring and compiling data.

In April, 1945, seven months after school had been in session, the copies of the three Gregg Competent Typists Tests were sent to the teachers of the participating schools. The end of the seventh month was chosen for giving the typewriting tests so that achievement could be judged as near the end of the year as possible and still not interfere with the teachers' regular work attendant to the close of the school year.

Specific instructions on how and when to give the tests were provided. The typewriting tests were to be ten minutes in length and were to be given at intervals of two weeks, the September copy to be given for the first test, the November copy for the second test, and the December copy for the third test. Hereafter, these tests will be

designated as Test 1, Test 2, and Test 3. The two-week interval was chosen to provide a sampling of three tests, with minimal readjustment in the teachers' planned instructional scheduling.

Uniform directions given to the pupils called for 70-space lines, double spacing, 5-space paragraph indentions, and 10-word penalty for each error, in conformity with the specifications of International Typewriting Contest Rules. All classes were accustomed to this requirement in their classroom tests. The pupils were asked to mark their errors, compute their net rate, and record on the test paper the number of gross words typed, number of errors, and net words a minute. The investigator reread all test papers, checked the computations, and verified or revised the recorded scores.

CHAPTER II

RESULTS OBTAINED AND TREATMENT OF DATA

Typewriting Tests

The individual scores obtained on the three typewriting tests in each of the five schools are presented in the series of data reported in Table II. Inspection of these data shows fairly close consistency in the scores of most of the pupils. Variations in individuals' records from day to day are typical of net scores in typewriting. The variations observable in Table II revealed no one test as educing markedly better scores than the other tests. For the purposes of this study, it was necessary to select or derive a single numerical score to represent pupil attainment in typewriting. Consideration was given to the possibility of using the best score, the median score, or the average of three scores. The problem was submitted to a seminar group of ten experienced high school and college teachers at Woman's College of the University of North Carolina. It was the consensus of this group, after discussion and study of the data, that the average of the three test scores would be a satisfactory index of typewriting achievement. Accordingly, that figure became the selected score to be used in the analyses presented in this study, and will be referred to as the "established score."

Table III summarizes by schools the mean scores obtained on the separate tests and the means obtained for the established scores. The differences between the various means were analyzed for statistical

TABLE II-A

INDIVIDUAL AND ESTABLISHED SCORES ON THE THREE TYPEWRITING TESTS IN SCHOOL 1

Pupil	Net Words a Minute			
	Test 1	Test 2	Test 3	Established Score
1	34	36	38	36
2	34	32	32	33
3	36	34	32	34
4	37	35	39	37
5	36	41	39	39
6	35	36	37	36
7	34	44	46	41
8	36	35	47	39
9	32	33	27	31
10	33	29	22	28
11	36	40	40	39
12	45	35	42	41
13	36	40	34	37
14	20	30	28	26
15	26	28	21	25
16	35	36	27	33
17	35	32	34	34
18	40	27	39	35
19	31	32	26	30
20	39	54	30	41
21	42	39	47	42
22	31	34	32	32
23	40	26	36	34
24	25	28	39	31
Mean Score	36.88	33.80	34.50	34.87

TABLE II-B

INDIVIDUAL AND ESTABLISHED SCORES ON THE THREE TYPEWRITING TESTS IN SCHOOL 2

	Net Words a Minute			
Pupil	Test 1	Test 2	Test 3	Established Score
1	35	27	23	28
2	28	14	23	17
3	16	34	27	26
4	47	43	43	44
5	37	33	35	35
6	25	15	22	21
7	29	23	25	26
8	19	13	31	20
9	37	32	33	34
10	33	24	24	27
11	29	29	30	29
12	43	41	46	43
13	17	11	15	14
14	35	34	39	36
15	39	37	42	39
16	52	53	48	51
17	0	0	0	0
18	12	13	12	12
19	23	19	0	14
20	24	15	25	21
21	22	17	28	22
22	25	24	28	26
23	35	30	36	34
24	30	36	28	31
25	39	34	31	35
26	36	41	36	38
27	27	29	28	28
28	31	32	35	33
29	35	34	22	30
30	6	9	15	10
Mean Score	29.00	24.50	28.00	27.50

TABLE II-C

INDIVIDUAL AND ESTABLISHED SCORES ON THE THREE TYPEWRITING TESTS IN SCHOOL 3

	Net Words a Minute			
Pupil	Test 1	Test 2	Test 3	Established Score
1	31	36	33	33
2	25	33	30	29
3	12	16	0	9
4	18	30	16	21
5	7	20	17	15
6	12	29	24	22
7	0	17	0	6
8	6	7	11	8
9	0	19	0	6
10	3	0	2	2
11	13	13	29	18
12	17	9	23	16
13	34	33	34	34
14	30	39	31	33
15	20	14	38	24
16	14	20	33	22
17	17	0	32	16
18	27	19	30	25
19	24	9	16	19
20	34	27	37	33
Mean Score	17.25	17.45	20.00	19.25

TABLE II-D

INDIVIDUAL AND ESTABLISHED SCORES ON THE THREE TYPEWRITING TESTS IN SCHOOL 4

	Net Words a Minute			
Pupil	Test 1	Test 2	Test 3	Established Score
1	8	12	10	10
2	10	14	4	9
3	22	35	36	31
4	0	17	16	11
5	28	22	23	24
6	14	18	23	18
7	0	17	16	9
8	26	21	23	23
9	47	59	43	50
10	7	10	9	9
11	30	33	35	33
12	28	41	29	33
13	44	53	42	46
14	20	20	21	20
15	14	16	15	15
16	22	22	30	25
17	29	22	34	28
18	30	38	31	33
19	22	18	26	22
20	26	29	23	26
21	0	0	0	0
22	15	21	20	19
Mean Score	21.68	24.50	23.13	22.33

TABLE II-E

INDIVIDUAL AND ESTABLISHED SCORES ON THE THREE TYPEWRITING TESTS IN SCHOOL 5

Pupil	Net Words a Minute			
	Test 1	Test 2	Test 3	Established Score
1	22	26	24	24
2	25	30	28	28
3	9	26	31	22
4	18	25	29	24
5	20	24	20	21
6	14	19	20	18
7	26	32	32	30
8	23	25	21	23
9	32	33	37	34
10	24	20	24	23
11	20	22	21	21
12	20	23	29	24
13	17	22	7	15
14	19	19	36	25
15	36	43	40	40
16	27	35	34	32
17	20	32	34	29
18	20	26	28	25
19	23	31	31	28
20	7	8	15	10
21	21	22	9	17
22	24	17	21	21
23	22	24	26	24
24	20	23	14	19
25	23	16	18	19
26	25	24	23	24
27	19	33	29	27
28	29	34	34	32
29	10	25	20	18
30	20	27	28	25
31	27	28	25	27
32	35	33	35	34
33	10	19	26	18
Mean Score	21.70	25.49	25.84	24.27

TABLE III

MEAN SCORES OBTAINED ON THE THREE TYPEWRITING TESTS AND THE ESTABLISHED SCORE FOR EACH OF THE FIVE SCHOOLS

School	No. of Cases	Test 1		Test 2		Test 3		Est. Score	
		M	S. D.	M	S. D.	M	S. D.	M	S. D.
1	24	36.88	5.4	33.80	8.3	34.50	9.3	34.87	3.9
2	30	29.00	13.3	24.50	11.6	28.00	10.9	27.50	10.7
3	20	17.25	10.3	17.50	11.0	20.00	10.9	19.25	11.5
4	22	21.68	12.2	24.50	13.2	23.13	11.4	22.33	10.0
5	33	21.70	6.8	25.50	6.9	25.84	7.9	24.27	6.3

significance by use of the formula D/σ_D. The ratios obtained were:

Schools	Difference Between Means	D/σ_D
1 and 5	10.60	7.61
1 and 3	15.62	5.68
1 and 4	12.54	5.41
1 and 2	6.37	3.44
2 and 3	8.25	2.67
2 and 4	5.17	1.76
2 and 5	3.23	1.42
3 and 5	5.02	1.91
3 and 4	3.08	.95
4 and 5	1.94	.79

School 1 is shown to be superior in achievement in typewriting to all the other schools, with ratios ranging from 3.4 to 7.6, indicating a real difference in all instances. The only other comparison that reveals a significant difference was that between School 2 and 3, with a ratio of 2.67. This meets the test of significance at the one-per-cent level. These results are considered later in connection with the data obtained on pupil interests.

The fact that Schools 4 and 5 showed only a slight difference in the means and were found earlier to be on the same level in intelligence scores suggested the possibility of intelligence as a determining variable. When, however, individual typewriting scores were correlated with intelligence scores, the coefficient of correlation[1] was found to be .36. As this *r* produces a coefficient of alienation[2] of .93, it indicates that mental

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[1] Henry E. Garrett, *Statistics in Psychology and Education* (New York: Longmans, Green and Co., 1945), p. 270.

[2] *Ibid.*, p. 345.

ability does not assure typewriting ability.

Occupational Interest Inventory

The individual scores obtained on the Inventory are reported in Table A in the Appendix, and the means and standard deviations obtained for each of the schools are reported in Table B (Appendix). Because the norms of the Inventory are expressed in percentiles, the data are presented in Table IV in terms of mean numerical scores translated into their equivalent "percentile norms". These data are shown graphically in Figures 1-5.

Fields of Interests

The division entitled Fields of Interests pertains to areas designated as Personal-Social, Natural, Mechanical, Business, Arts, and Sciences. Although the highest possible score for each field is 40, the designated scores for the percentile norms vary. For example, the percentile 50 represents 24-25 in Personal-Social, 18-19 in Science, and 13 in Mechanical. Because of these differences, the results are meaningful only when compared on the basis of percentile norms or profiles.

Personal-Social

The Personal-Social field is described by the authors as including "interests which involve primarily association with or service to individuals. These interests involve advice, service, physical care, personal attention, and health and medical service."

The interest measured in the Personal-Social field was found to be

TABLE IV

MEAN SCORES ON EACH PART OF THE OCCUPATIONAL INTEREST INVENTORY FOR EACH OF THE FIVE SCHOOLS

	School 1		School 2		School 3		School 4		School 5	
	M	Percentile	M	Percentile	M	Percentile	M	Percentile	M	Percentile
Fields of Interest--Possible score on Each Part...40										
P-S	24	50	25	50	23	40	25	50	25	50
N	14	50	14	50	14	50	10	20	10	20
MEC	12	40	13	50	11	30	13	50	11	30
B	25	50	23	40	25	50	27	60	29	70
A	25	60	27	70	24	50	25	60	27	70
S	20	60	19	50	20	60	16	40	16	40
Types of Interests--Possible Score on Each Part...21										
V	11	30	12	40	13	50	13	50	14	60
MAN	13	50	13	50	12	40	13	50	13	50
C	11	50	10	40	12	60	12	60	11	50
Level of Interests--Possible Score of 100										
L-I	67	70	64	60	67	70	60	50	64	60

P-S	Personal-Social	S	Science
N	Natural	V	Verbal
MEC	Mechanical	MAN	Manipulative
B	Business	C	Computative
A	Arts	L-I	Level of Interests

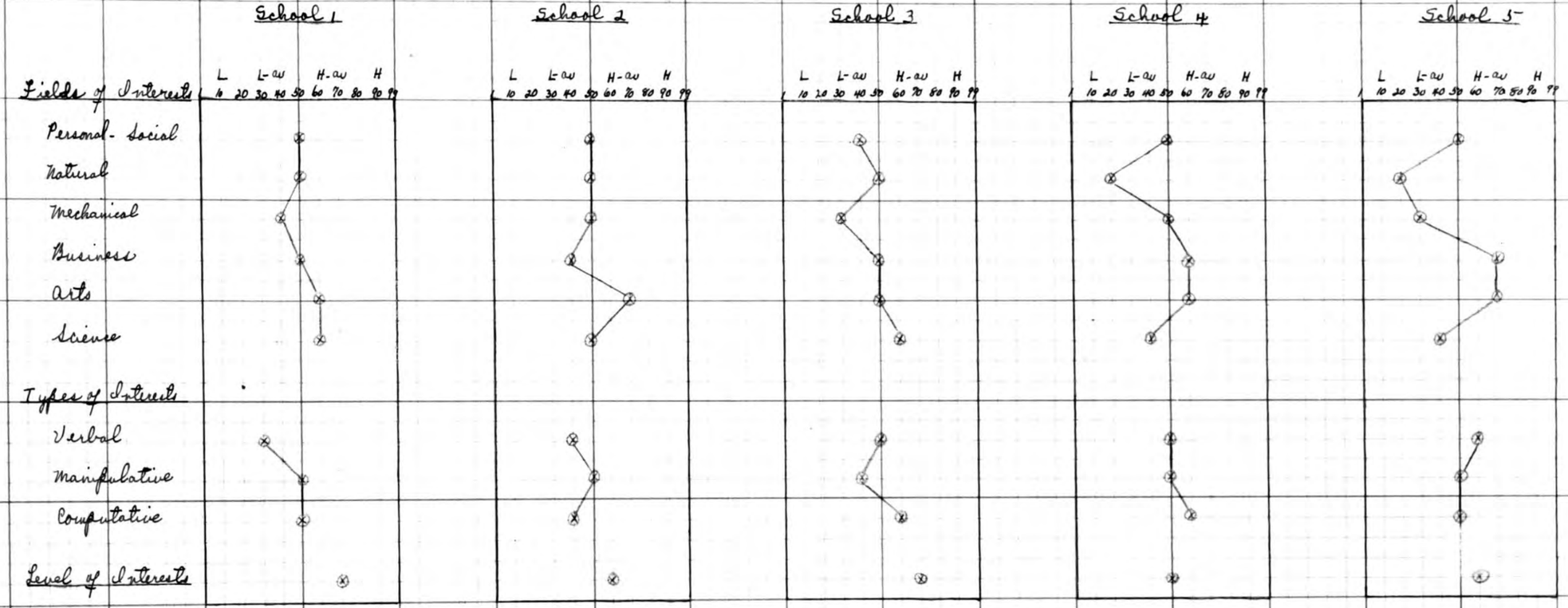

Figure 1 Figure 2 Figure 3 Figure 4 Figure 5

Mean Percentile Ranks attained by Each of the Schools on the Interest Inventory

average(percentile 50) in all the schools except School 3, which is below average (percentile 40). This school was the lowest in typewriting achievement, but not significantly lower than Schools 4 and 5, which have the same rank in Personal-Social interest as do the remaining schools.

Natural

"The Natural field includes agriculture and work related to use and protection of natural resources. It involves such activities as the raising of cattle, poultry, crops, and food products, the extraction of minerals, the care of forests, and fishing."

The profiles show that Schools 4 and 5 tend to be low in this measured interest, with the remaining three schools failing at the percentile 50. Schools 4 and 5 were likewise on the low level in intelligence and ranked third and fourth in typewriting achievement. School 1, superior in typewriting, was only average in this interest, as was School 3, lowest in typewriting results.

Mechanical

"The Mechanical field has to do with activities such as processing, manufacturing, building, constructing, and repairing. Important mechanical interests sampled include designing, machine operation, construction work, and repairing."

In this field the typewriting pupils tended to fall below average, School 1 ranking at the percentile 40; Schools 3 and 5 in the percentile 30. Though School 1 was superior to all the other schools in typing

achievement, it was low in Mechanical interest; Schools 3 and 5, low in typewriting, were also low in Mechanical interest.

Business

"The business field involves interests in selling, management, finance and distributive activities. It includes office and secretarial work as well as banking and investment interests."

The school averages ranged from percentiles 40 to 70 in this field, with little correspondence to their respective ranks in typewriting. School 1, significantly superior in typewriting, and School 3 lowest, fall in the same grouping (average) in Business interests; School 2, second in typing achievement, was low in Business; Schools 4 and 5 were low in typewriting but high in Business.

Presumably, pupils anticipating a career in business, particularly in office and secretarial work, would be enrolled in the typewriting course in sufficient numbers to reflect a dominance of interest in business among the various classes. The apparent negative tendency in the findings for this subpart of the Inventory was examined by application of the rank-difference method of correlation to the school means in typewriting and Business interest. The following array of mean numerical scores in Business interest and in typewriting shows their differences in rank:

School	Score		Rank		Difference
	Business	Typing	Business	Typing	in Rank
1	25	35	2.5	5	2.5
2	23	27.5	1	4	3
3	25	19	2.5	1	1.5
4	27	22	4	2	2
5	29	24	5	3	2

The rho obtained was -.21. This coefficient is too low to be considered indicative of negative relationship between class attainment in typewriting and Inventory scores in Business interest. When it is considered with the product-moment coefficient (-.077) obtained for the total group, and the r for the individual schools (ranging from -.150 to .042), as reported in Table V, the results suggest the absence of relationship between ability in typewriting and interest in business as measured by the inventory.

Arts

"The Arts field refers to interests in music, dramatic production, literary activities, and the skills involved in self-expression through drawing and painting. Outstanding interest areas sampled in the Inventory include painting and drawing, drama and radio, decorating and landscaping, and musical performance."

In this field, the percentile norms in the profiles tend to be high, with only one school (School 3) ranking as average. This school was lowest in achievement in typewriting. Schools 4 and 5, also low in typewriting, were high in Art, with percentiles 60 and 70, matching or surpassing School 1, which was significantly superior in typewriting.

TABLE V

COEFFICIENTS OBTAINED IN CORRELATIONS BETWEEN ESTABLISHED TYPEWRITING SCORES AND THE PHASES MEASURED BY THE OCCUPATIONAL INTEREST INVENTORY

	School 1	School 2	School 3	School 4	School 5	Total Group*
Number of Cases	24	30	20	22	33	129
	r	r	r	r	r	r
Fields of Interests						
P-S	.099	-.66	.546	.034	-.225	.018
N	.273	.131	-.251	-.098	.092	.059
MEC	-.427	-.159	-.302	.302	-.068	-.111
B	-.150	-.006	.001	.042	-.041	-.077
A	-.197	-.023	.093	-.105	.151	.007
S	.063	.189	-.014	.134	.004	.116
Types of Interests						
V	-.176	-.086	.119	.043	.081	-.057
MAN	-.066	-.080	-.045	.155	-.116	-.010
C	-.063	-.065	-.048	.008	-.057	-.157
Level of Interests						
L-I	-.066	.077	-.410	.056	-.030	-.029

P-S	Personal-Social	S	Science
N	Natural	V	Verbal
MEC	Mechanical	MAN	Manipulative
B	Business	C	Computative
A	Arts	L-I	Level of Interests

*The probable error for each of the correlations for the total number of cases is .06.

Science

"The Science field of interests includes activities related to research, experimentation, and invention. Among the science interest categories sampled in the Inventory are chemical research, mineral and petroleum production, plant and animal breeding, and scientific experimentation."

The percentile norms show a spread from low-average (40) to high-average (60). As in Business interest, School 1, highest in typewriting achievement, and School 3, lowest, are alike in this interest. Schools 4 and 5, low in typewriting achievement, were low in Science, with percentile 40.

None of the comparisons in Fields of Interests gave sufficient indication of established relationship between typewriting and the areas designated in this division to justify generalizations as to what fields of these measured interests are likely to accompany high or low typewriting achievement in schools such as those participating in this study.

Types of Interests

The division entitled Types of Interests pertains to Verbal, Manipulative, and Computational, the highest possible score being 21 for each of the three groups. The percentile 50 represents a score of 13 for Verbal, 13 for Manipulative, and 11 for Computational.

Verbal

"An interest is said to be verbal when it involves the giving of instructions, or rendering services through speech and writing. This

type of interest is exemplified in sales promotion, management, supervision, writing, lecturing, teaching, and dramatic activities."

In Verbal types, the percentiles range from 30 to 60. School 1, highest in typewriting, and School 2, second in rank, were low in Verbal. Schools 3 and 4, low in typewriting, were average in Verbal; School 5, which was low in typewriting, was high in Verbal. This tendency indicated the possibility of negative relationship between Verbal interests and typewriting ability, and the data were further inspected to examine this hypothesis. The mean numerical scores for Verbal interests and typewriting scores were arrayed as follows for analysis of their differences in rank:

School	Score		Rank		Difference in Ranks
	Verbal	Typing	Verbal	Typing	
1	11	35	1	5	4
2	12	28	2	4	2
3	13	19	3.5	1	2.5
4	13	22	3.5	2	1.5
5	14	24	5	3	2

It is apparent from the tabulation that there is not a direct progression in the relative ranks. The coefficient of rank difference correlation is -.65 and suggests that classes rating high in Verbal interest are likely to be in the lower brackets in typewriting skill. The coefficient obtained by the product-moment method for all cases as a total group, however, was found to be only -.057; the r for the individual schools ranged from -.176 to .119. As in the comparisons pertaining to Business interest (See Table V), the results seem to show absence of measured relationship rather than evidence of negative correspondence.

Manipulative

"Manipulative interests are those requiring work principally with the hands or feet, and in connection with which materials are handled by mechanical means. This interest is shown in shipping activities, handcrafts, painting, typing, machine operation, repairing, nursing, and surgery."

Although this type of interest includes typing and machine operation, the Inventory failed to reveal differences among the schools that might account for variations in typewriting attainment. All the schools were found to be Average in this type of interest except School 3, which was low-average in Manipulative interest as well as lowest in typewriting achievement. School 1, which was highest in typewriting, was not differentiated from the other schools in results on Manipulative type of interest.

Computational

"An interest is computational when it involves numerical calculations or the extensive use of numbers. Computational activities are used extensively in business and the sciences, and to a lesser degree in the other occupational fields. This type of interest is exemplified in bookkeeping, accounting, investment, scientific research, and in all phases of engineering."

All schools were found to be average and above in Computational type, except School 2, which was low-average percentile (40). Schools 3 and 4, though low in typewriting, were high in Computational; School 1,

superior in typewriting, was average in Computational type. Again, the results suggested the possibility of a negative relationship, as in Verbal and Business types. When the mean numerical scores in Computational interest and the typewriting scores for the classes were arrayed, as in the tabulation below, for analysis of their differences in rank, the rho was found to be -.70; but as in the preceding comparions, the product-moment coefficient (-.157) for all cases reported in Table V and for the individual schools (which varied from -.065 to + .008), failed to reveal evidence of relationship for the group as a whole or for

School	Score		Rank		Difference in Ranks
	Computational	Typing	Computational	Typing	
1	11	35	2.5	5	2.5
2	10	27.5	1	4	3
3	12	19	4.5	1	3.5
4	12	22	4.5	2	2.5
5	11	24	2.5	3	.5

individual schools.

The comparisons between Types of Interests and achievement in typewriting do not disclose relationships that could lead to generalizations.

Level of Interests

Level of Interests indicates whether the individuals' interests are associated with (1) routine tasks, (2) tasks requiring considerable skill, or (3) tasks requiring expert knowledge and judgment. The pupil reveals by his choice of activities whether his preferences are "low," "medium," or "high." These choices are assigned certain values in scoring. The authors have established percentile ranks for numerical scores, and

interpret the percentiles as follows: percentile 50 represents the middle level ("medium") of the three sets of tasks, showing preference for tasks of considerable skill; percentiles 30 to 40 represent a preference for routine tasks ("low" level); and 80 to 90 a preference for tasks requiring expert knowledge and judgment ("high" level). On the basis of the authors' classification, the results obtained in this study on Level of Interests, as shown in profiles on page 29a, indicate that the pupils were more interested in tasks requiring skill than in routine tasks.

The scores on Level of Interests represent attainment of the norms for percentile 70 in Schools 1 and 3, which were highest and lowest in typewriting achievement; percentile 60 in Schools 2 and 5; and percentile 50 in School 4.

As in the case of Fields of Interests and Types of Interests, the comparison of Level of Interests and typewriting achievement showed very little relationship.

The Total Group

The various comparisons of the schools as separate groups afforded no generalizations with respect to the relationship between established scores in typewriting and the various interests measured by the Occupational Interest Inventory. When all the 129 cases were considered as a total group, the product-moment correlations yielded coefficients too low to indicate relationship. Table V shows that the coefficients for typewriting achievement and Fields of Interests for the total group range from .116 $\pm$ .06 for interests in Science to -.111 $\pm$ .06 for Mechanical

interests. Coefficients for typewriting and the three Types of Interest are all negative and low, ranging from -.010 ± .06 for Manipulative to -.157 ± .06 for Computational. The coefficient for typewriting and Level of Interest is -.029 ± .06.

Comment was made earlier on the lack of evidence of relationship between attainment in typewriting and (a) the field of Business interest, which includes typewriting, and (b) the type of interest designated as Manipulative, which also pertains to typewriting. The coefficients obtained for scores on these subdivisions correlated with typewriting scores are negative and negligible -.077 ± .06 for Business; -.010 ± .06 for Manipulative.

The "established typewriting score" which was used as the representative single measure of the pupil's net rate in typewriting was the mean of three samplings. It does not represent his highest level of performance. For this reason, the field of Business interest was examined further in terms of the individual's maximum typewriting score as representing his highest degree of success attained. Correlation of maximum typewriting scores and the scores in the field of Business interest yielded a coefficient of -.098 ± .06, approximately the same result as that obtained by the use of the average or "established" score.

The Individual Schools

As the coefficients of correlation for the entire group of 129 cases afforded no generalizations regarding the relationship between established typewriting scores and the various interests measured by the Occupational Interest Inventory, the product-moment correlations of the established score and each phase of the Interest Inventory were obtained for each of the five schools separately. Table V reveals that most of these coefficients for the individual schools are negligible and slightly more than half are negative. In Fields of Interest, the coefficients range from -.427 for Mechanical interests in School 1 to .546 for Personal-Social interests in School 3. The coefficients for Personal-Social interest in all the schools except School 3 were consistently low. The interest profiles, page 29a, had shown this interest to be average in all schools except School 3, which was below average. For typewriting and Types of Interest in Table V, most of the coefficients are negative and low, ranging from -.176 for Verbal in School 1 to .119 for Verbal in School 3. For typewriting and Level of Interests, the highest positive coefficient is .056 for School 4, and the highest negative coefficient is -.410 for School 3.

As in the case of the total group, the coefficients obtained for scores on Business and Manipulative interest correlated with typewriting scores were too low to indicate relationship. The coefficients for Business ranged from -.150 for School 1 to .042 for School 4; Manipulative, from -.116 for School 5 to .155 for School 4.

Comparisons of Extremes

The various comparisons of the schools as a total group and as separate groups indicated little relationship between typewriting scores and the interests designated in the Interest Inventory. In the hope that some distinguishable associations might be revealed through comparisons limited to cases representing high and low extremes in typewriting ability, such cases were isolated for separate analyses. All pupils in the total group who typed 40 words or more a minute and all those who typed less than 10 words a minute were selected as the best and the poorest pupils. Table VIA gives the percentile norms obtained on the Occupational Interest Inventory, and Table VIB the numerical scores and other data recorded for these pupils. The differences between the means of the best and poorest groups obtained for each of the interest measures were examined for statistical significance. Table VII gives the results. In two instances the ratios found were in favor of the poorest typewriting pupils: 2.77 for Natural and 1.24 for Mechanical. The remaining ratios favored the best typewriting pupils and varied from .05 for Level of Interest to 1.87 for Manipulative interest.

The only difference approaching statistical significance was that of Natural interest, 2.77. This difference is not significant at the one-per-cent level, although it does meet the two-per-cent level of significance for samples of this size. The negative tendency here suggests that pupils rating high in Natural interest may be in the lower brackets in typewriting skill. In the product-moment correlation of Natural interest and typewriting for the total group of 129 girls, the $\underline{r}$ was .039 $\pm$ .06;

TABLE VI A

ESTABLISHED TYPEWRITING SCORES AND PERCENTILES ON THE OCCUPATIONAL INTEREST INVENTORY FOR THE 10 BEST AND 10 POOREST TYPEWRITING PUPILS

		Fields of Interests						Types of Interests			Level of Interests
Pupil	Est. Score	P-S	N	MEC	B	A	S	V	MAN	C	L-I
					Best						
1	51	70	20	40	50	80	40	60	50	70	30
2	50	70	30	90	50	40	40	60	50	60	40
3	46	40	10	80	60	70	60	60	60	30	70
4	44	50	30	60	30	70	60	10	70	20	50
5	43	80	10	20	90	70	20	80	50	70	30
6	42	40	80	10	20	70	80	10	40	20	20
7	41	70	30	10	50	50	80	30	70	80	60
8	41	70	50	40	40	30	80	50	40	90	90
9	41	50	20	20	50	80	50	40	70	30	30
10	40	40	10	70	70	30	90	10	70	70	90
					Poorest						
1	0	90	40	80	50	50	1	70	60	50	20
2	0	40	50	20	10	90	60	30	30	60	50
3	2	10	70	90	10	60	50	10	60	30	60
4	6	40	20	10	80	40	90	70	50	99	90
5	6	30	50	70	80	50	20	30	40	80	70
6	8	10	60	70	40	50	70	10	20	50	90
7	9	30	20	40	60	40	20	20	30	40	20
8	9	70	70	40	30	70	30	50	20	10	80
9	9	80	80	60	20	70	10	70	20	10	70
10	9	80	10	50	80	60	20	60	70	60	30

P-S	Personal-Social	S	Science
N	Natural	V	Verbal
MEC	Mechanical	MAN	Manipulative
B	Business	C	Computational
A	Arts	L-I	Level of Interests

TABLE VI B

ESTABLISHED TYPEWRITING SCORES, INTELLIGENCE QUOTIENT SCORES, AND NUMERICAL SCORES ON ALL PARTS OF THE OCCUPATIONAL INTEREST INVENTORY FOR THE 10 BEST AND 10 POOREST TYPEWRITING PUPILS

			Fields of Interests						Types of Interests			Level of Interests
Pupil	Est. Score	IQ	P-S	N	MEC	B	A	S	V	MAN	C	L-I
			40	40	40	40	40	40	21	21	21	100
Best Pupils												
1	51	132	27	10	12	26	29	16	14	13	14	56
2	50	114	27	11	20	25	21	16	14	13	12	59
3	46	146	22	5	18	27	28	20	14	14	9	67
4	44	128	25	12	14	21	28	20	8	15	8	60
5	43	112	29	8	9	34	28	12	16	13	14	55
6	42	135	25	9	10	26	29	19	12	15	9	56
7	41	109	28	12	6	26	24	24	11	15	15	71
8	41	109	27	14	12	24	19	24	13	12	7	76
9	41	112	25	9	10	26	29	19	12	15	9	56
10	40	97	27	13	8	30	28	14	17	9	13	78
Poorest Pupils												
1	0	119	33	13	19	25	24	6	15	14	11	50
2	0	85	22	15	10	17	34	21	11	11	12	61
3	2	120	17	18	26	16	25	18	6	14	9	63
4	6	105	23	10	6	33	21	27	15	13	19	78
5	6	107	20	14	17	33	23	13	11	12	16	65
6	8	158	17	17	16	24	24	24	7	10	11	76
7	9	92	21	10	12	27	22	13	8	11	10	50
8	9	122	27	18	12	21	27	15	13	10	6	68
9	9	133	30	21	14	19	27	9	15	10	5	67
10	9	101	30	5	13	33	25	13	14	15	12	54

P-S	Personal-Social	S	Science
N	Natural	V	Verbal
MEC	Mechanical	MAN	Manipulative
B	Business	C	Computative
A	Arts	L-I	Level of Interests

TABLE VII

COMPARISON OF MEANS OBTAINED ON EACH OF THE MEASURED INTERESTS FOR THE 10 BEST AND 10 POOREST TYPEWRITING PUPILS

	Means		Difference Between Means Best-Poorest	σ Difference	Ratio
	Best	Poorest			
			Fields of Interests		
P-S	26.2	24.0	2.2	2.35	.81
N	10.3	14.1	-3.8	1.37	(-)2.77
MEC	11.9	14.5	-2.6	2.10	(-)1.24
B	26.5	24.8	1.7	2.24	.76
A	26.3	25.2	1.1	1.55	.71
S	19.4	15.9	3.5	2.52	1.39
			Types of Interests		
V	13.8	11.5	2.3	1.40	1.64
MAN	13.7	12.0	1.7	.91	1.87
C	12.0	11.1	.9	1.68	.54
			Level of Interests		
L-I	63.4	63.2	.2	3.96	.05

P-S	Personal-Social	S	Science
N	Natural	V	Verbal
MEC	Mechanical	MAN	Manipulative
B	Business	C	Computative
A	Arts	L-I	Level of Interests

and for the individual schools, the r ranged from -.251 for School 3 to .273 for School 1. The interest profiles on page 29a had shown the five schools to be average or low in this measured interest. These varying results afforded no conclusive generalizations concerning the relationship between typewriting achievement and Natural interest.

Extremes in the distribution of intelligence quotients were also inspected for apparent differences in interest. Those scoring above 140 were isolated for analysis. There were only five pupils with scores below 90; in order to provide more cases for the comparison, all cases with intelligence scores below 95 were included. The percentiles obtained by these pupils on the Interest Inventory are given in Table VIII. The pupils with highest and lowest intelligence quotients disclosed a wide range of percentiles on all parts of the Inventory, there being the greater variation among those with the highest intelligence scores.

Highest and lowest age and grade levels were also examined to discover similarities or tendencies. The oldest pupils in the schools were 18; the youngest were 14. There were three who were 18 years of age, and nine who were 14. Table IX gives their percentiles on all parts of the Inventory. The scores of the three eighteen-year olds show a wide range in percentiles, the lowest being in Science, with percentiles from 10 to 40. For the nine cases of youngest pupils, 14 years old, there is likewise a wide range of percentiles in all parts of the Inventory, except Natural, which is low, ranging below average from 10 to 40.

Extremes in grade levels also disclose a wide range in every part of the Interest Inventory, as shown in the data isolated for Grades 12

TABLE VIII

PERCENTILES ON THE OCCUPATIONAL INTEREST INVENTORY FOR PUPILS WITH THE HIGHEST AND LOWEST INTELLIGENCE QUOTIENTS

		Fields of Interests						Types of Interests		Level of Interests	
Pupil	IQ	P-S	N	MEC	B	A	S	V	MAN	C	L-I
					Highest						
1	158	10	60	70	40	50	70	10	20	50	90
2	152	80	30	20	80	70	20	60	40	30	80
3	148	50	70	50	10	80	50	30	40	20	80
4	147	40	50	50	50	70	30	60	50	20	80
5	146	30	80	10	40	70	70	20	30	40	70
6	146	40	10	80	60	70	60	60	60	30	70
7	145	80	70	90	20	70	30	50	30	1	40
8	143	40	80	40	10	50	40	20	30	10	80
9	142	20	30	60	40	90	70	30	30	50	90
10	141	10	80	50	10	90	90	10	30	10	80
					Lowest						
1	82	80	20	60	80	30	30	40	50	50	90
2	82	40	10	50	90	60	40	99	50	90	60
3	83	70	10	20	60	30	20	60	50	40	80
4	85	40	50	20	10	90	60	30	30	60	50
5	86	50	50	70	70	50	20	40	70	40	30
6	91	50	40	50	30	40	80	60	60	50	80
7	92	30	20	40	60	40	20	10	30	40	20
8	92	50	20	20	60	70	60	90	30	70	70
9	93	70	30	20	80	80	10	90	40	70	70
10	93	40	60	40	30	60	60	70	20	20	70
11	94	70	30	20	80	80	10	90	40	70	70

P-S	Personal-Social	S	Science
N	Natural	V	Verbal
MEC	Mechanical	MAN	Manipulative
B	Business	C	Computative
A	Arts	L-I	Level of Interests

TABLE IX

PERCENTILES ON OCCUPATIONAL INTEREST INVENTORY FOR ALL PUPILS WHO WERE 18 AND 14 YEARS OF AGE

		Fields of Interests						Types of Interests		Level of Interests
Pupil	Age	P-S	N	MEC	B	A	S	V	MAN	C	L-I
1	18	80	50	30	40	90	10	70	50	20	40
2	18	70	70	40	30	70	30	20	20	10	80
3	18	40	10	50	90	60	40	99	50	90	60
1	14	90	10	70	70	70	1	60	80	50	60
2	14	90	10	20	90	10	70	60	30	60	10
3	14	30	20	40	60	40	20	10	30	40	20
4	14	70	30	90	50	40	40	60	50	60	40
5	14	80	10	50	80	60	20	60	70	60	30
6	14	30	30	20	60	80	60	40	50	90	90
7	14	40	10	80	60	70	60	60	60	30	70
8	14	90	40	70	30	60	10	20	50	10	20
9	14	60	20	10	80	90	30	70	70	80	50

P-S	Personal-Social	S	Science
N	Natural	V	Verbal
MEC	Mechanical	MAN	Manipulative
B	Business	C	Computative
A	Arts	L-I	Level of Interests

and 9 in Table X. Grade 9 reveals its best percentiles on Business interest, all being average and above (50 to 90); however, there was much variation on the other phases of the Inventory.

TABLE X

PERCENTILES ON THE OCCUPATIONAL INTEREST INVENTORY
FOR ALL PUPILS IN GRADES 12 AND 9

		Fields of Interests							Types of Interests		Level of Interests
Pupil	Grade	P-S	N	MEC	B	A	S	V	MAN	C	L-I
1	12	10	30	50	10	90	90	10	40	20	90
2	12	70	50	40	40	30	80	50	40	20	90
3	12	40	50	50	70	40	50	20	50	80	30
4	12	50	10	20	90	70	40	80	90	80	30
5	12	20	20	40	70	40	90	10	30	99	90
6	12	10	80	50	10	90	90	10	30	10	80
7	12	40	90	40	10	50	40	20	30	10	80
8	12	80	50	30	40	90	10	70	50	20	40
9	12	70	80	50	20	30	60	30	70	20	70
10	12	70	20	40	50	80	40	60	50	70	30
11	12	20	90	30	1	60	90	1	40	20	50
12	12	80	10	90	20	70	30	50	30	1	40
13	12	70	70	40	30	70	30	50	20	10	80
14	12	50	20	60	30	90	40	50	60	30	80
15	12	70	20	10	70	50	80	50	30	70	80
16	12	10	80	10	20	80	90	60	80	40	90
17	12	20	60	40	10	80	90	30	1	50	90
18	12	30	90	60	20	20	70	10	30	40	90
19	12	60	10	90	90	30	10	70	40	40	30
20	12	20	30	60	40	90	70	30	30	50	90
1	9	90	10	20	90	10	70	60	30	60	10
2	9	30	20	40	60	40	20	10	30	40	20
3	9	70	30	90	50	40	40	60	50	60	40
4	9	80	10	50	80	60	20	60	70	60	30
5	9	30	30	20	60	80	60	40	50	90	90
6	9	40	10	80	60	70	60	60	60	30	70
7	9	40	10	90	60	90	10	30	50	40	40
8	9	80	30	30	80	60	10	60	60	50	1
9	9	40	50	20	70	99	60	30	30	60	50
10	9	70	50	70	70	10	40	30	40	60	40

P-S Personal-Social
N Natural
MEC Mechanical
B Business
A Arts
S Science
V Verbal
MAN Manipulative
C Computative
L-I Level of Interests

CHAPTER III

SUMMARY AND CONCLUSIONS

This study has attempted to discover relationship between typewriting scores and interest as measured by the Occupational Interest Inventory--Intermediate, Form A, by Lee and Thorpe, which purports to measure occupational fields, types, and levels of interests of high school pupils.

The subjects were 129 girls enrolled in beginning typewriting classes in 1944-45 in four schools in North Carolina and one school in Florida. The schools represented varied community environments. One school was located in the center of army camps and war industries; one in a college community and industrial section; one in a tourist center; one in a rural community; and one in an industrial center. The pupils tested were of the usual high school age, 14 to 18 years, in Grades 9 to 12. Most of the pupils were 15 and 16 years of age and in Grades 10 and 11. The Terman-McNemar Test of Mental Ability revealed two levels of intelligence among the schools, with the means of three schools averaging from 121 to 125 in intelligence quotients and the remaining two schools averaging 103.2 and 107.2.

Typewriting achievement in this study was measured by three Gregg Competent Typist Tests issued for the months of September, November, and December of the year 1943. Scores were reported in terms of the average number of net words a minute obtained in three ten-minute testings, being designated as "established typewriting scores." The results revealed

wide variability among the schools, ranging from 0 words a minute to 51 words. School 1 was found to be statistically superior to all the others in typewriting achievement. The ratios of the differences between the means to their standard errors ranged from 3.4 to 7.6 when the results obtained in this school were compared with those obtained in the four other schools. The only other comparison yielding a difference that approached statistical significance was that of Schools 2 and 3, with a ratio of 2.67. Schools 4 and 5 were found to be similar in typewriting achievement, with a ratio of .79.

The fact that School 1, highest in typewriting, was also found to have a high mean score on the Terman-McNemar Test of Mental Ability suggested that intelligence might have been a determining variable. Two other schools, however, were in the same bracket in intelligence yet significantly lower in typewriting achievement. When intelligence quotients and the established scores in typewriting were correlated for the total group, the coefficient was found to be .36 ± .05. This figure is comparable to findings reported by other investigators.

On the assumption that the wide spread of ages and grades might have been responsible for the variability in typewriting achievement between the schools, the established typewriting scores of the extremes in age and in grades were isolated for analysis and were found to reveal no differences that would account for the wide range in typewriting scores. The range of scores for the 17- and 18-year-old pupils was 0 words a minute to 51 words, as compared with 0 words to 47 words for 14-year-old pupils. For Grade 12, the range was 9 words a minute to 51, as compared

with 0 words to 50 for Grade 9. The schools were similar in distribution of ages and grades.

Interest was measured in this study by Lee and Thorpe's Occupational Interest Inventory--Intermediate, Form A. This inventory has three divisions: Fields of Interest with six subparts, 40 being the highest possible score on each subpart; Types of Interests with three subparts, 21 the highest possible score on each subpart; Level of Interest, 100 the highest possible score. The raw numerical scores were converted to "percentile norms" from tables of norms given by the authors.

A comparison of typewriting achievement and the interest profiles showed a similarity in profiles of Schools 1 and 2 for Fields of Interests, but a statistically significant difference in typewriting scores. Schools 4 and 5 with similar profiles for Fields of Interests, were both low in typewriting; while School 3, the lowest in typewriting, had a profile unlike all the other schools in Fields of Interests.

The results obtained on Level of Interests indicated that the pupils in all schools were more interested in performing tasks requiring skill than in routine tasks.

Statistical comparison of established typewriting scores and the scores obtained on the Inventory afforded no conclusive evidence of relationship. The product-moment coefficients of correlation for the total group of 129 cases ranged from -.157 to + .116, for typewriting and components of the Inventory; the coefficients for the individual schools varied from -.427 for Mechanical interest in School 1 to .546 for personal-Social interest in School 3, most of the coefficients being negligible

and slightly more than half negative. The r's for Personal-Social interest in all schools except School 3 were consistently low. No single part of the Inventory showed a consistent relationship with typewriting in this study.

When the differences between the means obtained on each of the interest measures for the best and poorest pupils were analyzed for statistical significance, the only ratio approaching significance was that of Natural interest, 2.77 in favor of the poorest pupils. The assumption that pupils rating high on Natural interest might be low in typewriting achievement was examined by inspecting the product-moment r of the total group for Natural interest and typewriting achievement (.039), and the r of the five individual schools (ranging from -.251 to +.273). The interest profiles had shown the five schools to be average or low in this interest. No generalization concerning relationship between typewriting achievement and Natural interest can be made on the basis of these varying results.

Correlation of the individuals' best typewriting scores and their scores in the field in which typewriting is included--Business--yielded a coefficient of $-.098 \pm .06$, which was approximately the same result as that obtained by use of the "established scores."

When extremes of intelligence, age, and grade levels were used as bases of comparison, no distinguishable differences in interests were revealed.

King's[1] conclusion that "Interest tests are inferior to the mental tests as indices of ability . . ." is supported by the findings in this study: The coefficient of correlation between the established scores of typewriting and intelligence was .56; between established typewriting scores and all subparts of the Inventory, the coefficients for the total group ranged from -.157 to + .116, and for the individual schools from -.427 to + .546, with most coefficients being low and negligible.

In view of the apparent lack of relationship revealed in the findings of this study, the Occupational Interest Inventory is not recommended as an instrument for predicting success in typewriting achievement as measured in the schools of this investigation.

The negative findings reported in this study are not to be interpreted as indicating that interest is not a factor in typewriting achievement. The fact that the Interest Inventory applied in this investigation yielded no distinct groupings of interest among the different schools and failed to differentiate best and poorest typewriting pupils suggests that it is not a suitable instrument for measuring the type of interest for which a measure was sought in this study. Improved techniques in the defining, classifying, measuring, and recording of high school pupils' interests may provide future investigators with a means of determining whether interest is a conditioning factor in typewriting ability, and to what extent it operates in successful typewriting achievement by an individual or a group.

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[1] Leo Hamilton King, Mental and Interest Tests, Their Evaluation and Comparative Effectiveness as Factors of Prognosis in Secondary Education, (New York: Bureau of Publications, Teachers College, Columbia University, 1931), p. 114.

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APPENDIX

TABLE A

DATA OBTAINED FROM TYPEWRITING TESTS, OCCUPATIONAL INTEREST INVENTORY, AND THE TEST OF MENTAL ABILITY ADMINISTERED TO THE FIVE SCHOOLS

			Fields of Interests						Types of Interests			Level of Interests	
No. of Pupil	Est. Score	Best Score	P-S	N	MEC	B	A	S	V	MAN	C	L-I	IQ
			40	40	40	40	40	40	21	21	21	100	
						SCHOOL I							
1	36	38	22	15	13	25	28	14	14	13	7	68	147
2	33	34	13	12	13	17	35	30	8	12	8	81	130
3	34	36	24	6	14	21	30	25	12	9	9	60	120
4	39	47	26	22	15	28	15	14	10	10	8	64	100
5	37	39	26	19	9	24	23	19	13	10	8	71	112
6	39	41	23	18	12	18	26	23	10	13	9	76	121
7	36	37	21	15	18	22	20	24	6	11	11	58	130
8	41	46	27	14	12	24	19	24	13	12	7	76	109
9	31	33	20	16	8	32	21	23	13	12	13	70	120
10	28	33	19	24	22	21	14	20	8	11	9	73	125
11	39	40	21	21	5	23	28	22	10	11	10	66	146
12	41	42	28	12	6	26	24	24	11	15	15	62	109
13	37	40	29	11	9	31	27	13	14	12	9	71	152
14	26	30	24	11	15	18	28	24	12	9	9	78	128
15	25	28	28	13	9	27	31	13	13	15	13	62	115
16	33	35	22	15	13	30	21	19	10	13	16	55	126
17	34	35	20	12	7	30	29	22	16	11	15	69	120
18	35	40	21	15	14	29	19	22	12	9	15	68	137
19	30	32	24	5	10	36	28	17	16	17	15	54	112.
20	41	54	25	9	10	26	29	19	12	15	9	56	112
21	42	47	23	21	5	19	28	24	8	12	8	51	135
22	32	34	32	7	16	30	27	8	14	16	11	60	138
23	34	40	30	11	15	25	28	11	11	16	9	50	122
24	31	39	23	14	14	22	30	17	9	12	8	65	132

P-S	Personal-Social	S	Science
N	Natural	V	Verbal
MEC	Mechanical	MAN	Manipulative
B	Business	C	Computative
A	Arts	L-I	Level of Interests

TABLE A

SCHOOL 2 (Continued)

No. of Pupil	Est. Score	Best Score	P-S	N	MEC	B	A	S	V	MAN	C	L-I	IQ
			40	40	40	40	40	40	21	21	21	100	
1	28	35	19	9	12	29	22	29	8	11	19	78	135
2	17	28	23	11	16	19	26	25	12	11	10	74	122
3	26	34	14	20	13	14	31	28	6	11	5	71	141
4	44	47	25	12	14	21	28	20	8	15	8	60	128
5	35	37	23	28	12	17	23	17	9	11	5	72	143
6	21	25	21	9	18	22	23	27	8	11	9	71	108
7	26	29	31	12	13	36	19	9	14	13	14	51	109
8	20	31	29	15	11	23	33	9	15	13	7	57	115
9	34	37	26	11	15	19	29	20	11	11	8	68	121
10	27	33	25	15	14	20	29	17	12	11	6	78	121
11	29	30	26	13	11	26	17	27	9	14	9	71	130
12	43	46	29	8	9	34	28	12	16	13	14	55	112
13	14	17	34	13	14	29	17	13	13	12	10	49	91
14	36	39	28	21	13	18	19	21	11	15	8	66	140
15	39	42	22	19	6	36	15	22	14	10	16	65	133
16	51	53	27	10	12	26	29	16	14	13	14	56	132
17	0	0	33	13	19	25	24	6	15	14	11	50	119
18	12	13	27	9	11	31	30	12	15	15	12	60	105
19	14	23	19	27	10	21	22	21	8	10	8	71	114
20	21	25	16	8	15	25	35	21	13	13	12	63	104
21	22	28	31	11	12	25	26	15	15	11	18	52	131
22	26	28	22	9	24	28	29	8	16	8	11	51	135
23	34	36	24	18	13	17	29	19	11	12	8	68	148
24	31	36	18	20	16	17	31	18	6	11	7	60	115
25	35	39	21	11	19	23	18	12	10	13	6	56	110
26	38	41	24	16	6	31	21	21	13	13	5	66	118
27	33	35	18	28	11	10	25	28	5	12	7	61	124
28	28	29	23	7	12	21	31	26	7	13	12	77	128
29	30	35	29	7	23	19	27	15	13	11	3	59	145
30	10	15	26	12	12	23	34	13	15	14	9	56	121

TABLE A

SCHOOL 3 (Continued)

No. of Pupil	Est. Score	Best Score	Fields of Interests						Types of Interests			Level of Interests	
			P-S	N	MEC	B	A	S	V	MAN	C	L-I	IQ
			40	40	40	40	40	40	21	21	21	100	
1	33	36	34	7	10	34	24	11	12	14	16	63	114
2	29	33	26	22	10	17	24	18	10	13	15	59	140
3	9	16	27	18	12	21	27	15	13	10	6	68	122
4	21	31	25	10	14	22	33	16	13	14	9	72	109
5	15	20	28	9	7	30	23	24	13	11	14	69	98
6	22	29	25	18	9	20	27	24	12	14	12	68	129
7	6	17	20	14	17	33	23	13	11	12	16	65	107
8	8	11	17	17	16	24	24	22	7	10	11	76	158
9	6	19	23	10	6	33	21	27	15	13	19	78	105
10	2	3	17	18	26	16	25	18	6	14	9	63	120
11	18	29	16	20	6	19	30	29	14	16	10	76	139
12	16	23	22	6	11	30	27	24	12	14	17	76	109
13	34	34	29	9	17	27	26	15	12	12	10	65	124
14	33	39	18	16	12	16	30	28	11	8	11	83	117
15	24	38	26	5	12	32	19	26	14	15	17	80	120
16	22	33	20	14	25	14	25	21	7	13	6	62	126
17	16	32	20	26	15	19	18	22	8	11	10	73	122
18	25	30	26	6	22	35	20	11	15	12	10	54	121
19	19	25	21	22	18	28	14	17	7	13	10	64	102
20	33	37	25	17	12	24	19	23	9	13	9	74	120

TABLE A

SCHOOL 4 (Continued)

No. of Pupil	Est. Score	Best Score	Fields of Interests						Types of Interests			Level of Interests	
			P-S	N	MEC	B	A	S	V	MAN	C	L-I	IQ
			40	40	40	40	40	40	21	21	21	100	
1	10	10	23	7	13	34	26	16	18	13	17	62	82
2	9	14	30	21	14	19	27	9	15	10	5	67	133
3	31	36	28	13	12	23	23	20	11	10	14	52	99
4	11	17	24	15	17	29	23	12	12	15	10	54	86
5	24	28	31	8	9	35	15	22	14	11	12	48	103
6	18	23	27	15	16	30	16	16	11	12	12	59	95
7	9	18	21	10	12	27	22	13	8	11	10	50	92
8	23	26	22	13	11	20	30	24	9	14	8	55	112
9	50	59	27	11	20	25	21	16	14	13	12	59	114
10	9	10	30	5	13	33	25	13	14	15	12	54	101
11	33	35	21	12	10	28	29	20	12	13	18	79	107
12	33	41	25	14	12	28	23	18	12	12	12	65	118
13	46	53	22	5	18	27	28	20	14	14	9	67	146
14	20	21	23	5	20	28	35	9	11	13	10	57	111
15	15	16	25	13	13	21	22	26	14	14	11	70	91
16	25	30	31	10	7	29	28	15	16	16	13	70	118
17	28	34	30	11	11	31	25	11	14	14	11	42	96
18	33	38	23	23	17	21	25	11	10	13	5	50	108
19	22	26	24	9	12	33	27	14	17	11	14	64	117
20	26	29	26	11	18	23	25	15	12	12	6	63	120
21	0	0	22	15	10	17	34	21	11	11	12	61	85
22	19	21	24	8	7	21	33	21	16	13	15	78	121

TABLE A

SCHOOL 5 (Continued)

No. of Pupil	Est. Score	Best Score	Fields of Interests						Types of Interests			Level of Interests	
			P-S	N	MEC	B	A	S	V	MAN	C	L-I	IQ
			40	40	40	40	40	40	21	21	21	100	
1	24	26	32	13	15	34	19	10	17	12	11	63	93
2	28	30	23	11	9	34	28	15	18	17	13	66	120
3	22	31	26	9	8	31	31	15	15	15	15	61	105
4	24	29	26	10	15	27	29	14	10	12	10	61	97
5	21	24	29	13	8	23	34	13	15	15	9	59	100
6	18	20	18	12	14	23	31	22	11	11	11	73	142
7	30	32	27	19	8	21	33	12	12	9	8	51	114
8	23	25	29	9	13	29	25	15	14	12	13	61	100
9	34	37	24	12	9	18	30	27	11	12	9	72	99
10	23	24	25	10	10	23	26	11	12	15	8	64	105
11	21	22	19	13	9	30	26	22	9	15	15	79	94
12	24	29	28	14	7	36	23	12	16	15	13	53	107
13	15	22	29	14	8	32	18	19	14	12	15	62	101
14	25	36	17	16	33	28	23	23	9	11	15	58	108
15	40	43	27	13	8	30	28	14	17	9	13	78	97
16	32	35	23	3	13	22	29	15	13	11	8	58	110
17	29	34	25	13	6	34	24	17	10	14	14	65	99
18	25	28	21	11	18	36	21	13	12	13	14	71	107
19	28	31	25	10	9	33	27	16	17	15	14	47	102
20	10	15	30	10	14	31	20	14	12	13	11	74	82
21	17	22	24	12	8	27	31	18	16	13	14	78	105
22	21	24	27	6	12	31	23	20	16	14	16	77	110
23	24	26	27	7	9	28	20	13	14	13	10	68	83
24	19	23	16	10	10	20	28	20	10	10	14	69	110
25	19	23	25	10	10	27	28	20	17	11	13	65	92
26	24	25	31	7	15	29	25	13	14	11	12	49	94
27	27	33	28	9	10	29	28	16	15	14	11	64	95
28	32	34	20	7	14	33	28	18	14	13	15	63	125
29	18	25	30	8	14	26	28	14	12	8	8	55	103
30	25	28	26	4	20	30	22	18	12	16	12	77	116
31	27	28	28	12	9	31	29	11	17	12	14	66	93
32	34	35	23	17	12	22	26	20	15	10	8	67	93
33	18	26	29	14	8	30	24	15	13	13	9	63	99

TABLE B

MEAN SCORES ON EACH PART OF THE OCCUPATIONAL INTEREST INVENTORY FOR EACH OF THE FIVE SCHOOLS

	School 1		School 2		School 3		School 4		School 5	
	M	S. D.	M	S. D.	M	S. D.	M	S. D.	M	S. D.
Fields of Interests--Possible Score on Each Part. . .40										
P-S	23.78	5.34	24.87	2.82	22.9	5.34	25.04	3.51	25.27	3.09
N	14.25	5.19	14.2	6.07	14.2	7.16	10.21	4.92	10.09	1.81
MEC	12.01	41.29	13.04	41.05	11.05	5.31	13.27	2.37	11.09	3.45
B	25.38	4.92	23.3	6.42	24.85	6.94	26.77	5.16	28.54	4.95
A	25.37	5.16	26.51	6.63	24.25	4.95	25.18	1.47	27.36	3.78
S	19.51	7103	18.83	6.29	20.35	5.58	16.18	4.67	15.76	3.9
Types of Interests--Possible Score on Each Part. . .21										
V	11.38	2.59	12.47	3.52	12.64	2.91	12.91	2.07	13.64	2.42
MAN	12.63	2.14	12.63	2.12	12.4	2.03	12.86	1.17	12.91	2.44
C	10.63	3.24	9.87	4.01	11.95	3.33	12.46	3.59	10.9	2.27
Level of Interests--Possible Score of 100										
L-I	66.71	8.35	63.5	8.38	67.0	7.97	60.18	11.41	64.23	7.8

P-S Personal-Social
N Natural
MEC Mechanical
B Business
A Arts
S Science
V Verbal
MAN Manipulative
C Computative
L-I Level of Interests

TERMAN–McNEMAR TEST OF MENTAL ABILITY

By LEWIS M. TERMAN
Stanford University, California

and QUINN McNEMAR
Stanford University, California

C

TEST: FORM C

Name .....

Date of birth ..... Month ..... Day ..... Year

Age ..... Grade ..... Boy ..... Girl .....

School .....

City ..... State .....

Teacher ..... Date .....

TEST	SCORE
1	
2	
3	
4	
5	
6	
7	
TOTAL	
MA	
IQ	

Study the examples below in order to see how the answer spaces should be marked to indicate the correct answers.

1. Steel is made from
1 lead 2 iron 3 tin 4 copper 5 zinc 1

1 2 3 4 5

The correct answer, ***iron,*** *is number 2, so the second answer space has been blackened.*
You mark the correct answers for the remaining samples in the same way.

2. A horse always has
6 rider 7 stable 8 shoes 9 hoofs 10 saddle 2

6 7 8 9 10

3. A quart is one fourth of a
1 gallon 2 pint 3 bushel 4 barrel 5 keg 3

1 2 3 4 5

In taking this test, you are first to decide which answer is correct, and then blacken with a soft *pencil* the answer space which is numbered the same as your choice for the correct answer. Make your mark as long as the pair of lines, and move the pencil up and down firmly to make a **heavy black** line. If you change your mind, erase your first mark completely.

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 TMCNTMA : C-8

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Edition a

TEST 7. BEST ANSWER

Read each statement and mark the answer space which has the same number as the answer which you think is BEST.

SAMPLE. We should not put a burning match in the wastebasket because
1 Matches cost money. 2 We might need a match later.
3 It might go out. 4 It might start a fire. . . . . 1 2 3 ■ 4

1. The saying, "Idle brains are the devil's workhouse," means
1 The devil is lazy. 2 People who are idle get into trouble.
3 Many hands make light work. 4 The devil works with his brains. . . . . 1 — 1 2 3 4

2. The saying, "It's an ill wind that blows nobody good," means that
5 Winds bring rain. 6 That which brings misfortune to some may help others.
7 Trade winds help commerce. 8 It's easy to catch cold in a storm. . . . . 2 — 5 6 7 8

3. Farmers rotate crops because →
1 Variety is the spice of life. 2 It confuses the plant pests.
3 It helps maintain soil fertility. 4 It gives the farmer a balanced diet. . . . . 3 — 1 2 3 4

4. The saying, "Little strokes fell great oaks," means
5 Continued effort brings results. 6 Oak trees are weak.
7 Little strokes are best. 8 Anyone can fell an oak. . . . . 4 — 5 6 7 8

5. The saying, "A miss is as good as a mile," means 7→
1 A girl can walk just about a mile. 2 Errors are unpardonable.
3 The evil men do lives after them. 4 A failure is a failure, no matter how small. . . . 5 — 1 2 3 4

6. The saying, "It never rains but it pours," means
5 Salt stays dry when it rains. 6 Every cloud has a silver lining.
7 Troubles seldom come singly. 8 Storms are more frequent than showers. . . . . 6 — 5 6 7 8

7. The cause of echoes is →
1 Static electricity in the air. 2 The reflection of sound waves.
3 The absence of anything in the air. 4 Not known. . . . . 7 — 1 2 3 4

8. The saying, "Look before you leap," means
5 Consider first, act afterward. 6 Trust your eyes, but not your feet.
7 Anything is right which looks right. 8 Never take chances. . . . . 8 — 5 6 7 8

9. The saying, "Never ride a free horse to death," means
1 Never accept free rides. 2 Never abuse privileges granted as favors.
3 One should prize anything that is free. 4 A horse is to ride, not to kill. . . . . 9 — 1 2 3 4

10. The saying, "If the shoe fits, wear it," means
5 Be sure to buy shoes that fit. 6 Give the devil his due.
7 Don't take unnecessary steps. 8 Recognize your own faults and virtues. . . . . 10 — 5 6 7 8

11. Copper is used for electric wiring because
1 It is decorative. 2 It is easily bent.
3 It retains heat. 4 It is a good conductor. . . . . 11 — 1 2 3 4

12. The saying, "Don't cross your bridges till you come to them," means
5 Where there's a will there's a way. 6 Everything comes to him who waits.
7 Don't anticipate possible troubles. 8 Bridges are dangerous. . . . . 12 — 5 6 7 8

Score . . . . .

TEST 1. INFORMATION

Mark the answer space which has the same number as the word that makes the sentence TRUE.

SAMPLE. Our first President was
1 Adams 2 Washington 3 Lincoln 4 Jefferson 5 Monroe . . . .

1 2 ▌ 3 4 5

1. Polo is a kind of
1 disease 2 work 3 bear 4 game 5 language 1

2. Herring is a kind of
6 wig 7 flower 8 pattern 9 jewel 10 fish 2

3. The lyre was an early instrument used in
1 music 2 writing 3 mining 4 farming 5 sculpturing 3

4. Linen is made from
6 hair 7 jute 8 flax 9 rayon 10 latex 4

5. Burlap is a kind of
1 lumber 2 stone 3 hood 4 fabric 5 comedy 5

6. Quicksilver is another name for
6 chromium 7 tin 8 mercury 9 aluminum 10 lead 6

7. The number of pounds in a ton is
1 (*1000*) 2 (*2000*) 3 (*3000*) 4 (*4000*) 5 (*5280*) 7

8. Chinchilla is a kind of
6 fur 7 seasoning 8 chemical 9 malady 10 furniture 8

9. The fathom is a measure of
1 weight 2 curvature 3 hardness 4 depth 5 strength 9

10. Larceny is a term used in
6 forestry 7 medicine 8 theology 9 pedagogy 10 law 10

1

11. Napoleon's final defeat was at
1 Waterloo 2 Paris 3 Verdun 4 Elba 5 Leipzig 11

12. The dynamo produces
6 dynamite 7 powder 8 electricity 9 gas 10 steam 12

13. Pasteur was a famous
1 traveler 2 boxer 3 artist 4 bacteriologist 5 physicist 13

14. The Pharaohs were kings of
6 Babylon 7 Jerusalem 8 Syria 9 Greece 10 Egypt 14

15. Sonata is a term used in
1 drawing 2 drama 3 music 4 poetry 5 phonetics 15

16. The Colosseum was an
6 amphitheater 7 aqueduct 8 aquarium 9 archway 10 army 16

17. The larynx is in the
1 abdomen 2 throat 3 head 4 ear 5 pelvis 17

18. Among birds that migrate widely are
6 eagles 7 cardinals 8 owls 9 robins 10 quail 18

19. Emeralds are usually
1 red 2 yellow 3 green 4 purple 5 blue 19

20. Sirloin is a cut of
6 mutton 7 beef 8 veal 9 lamb 10 pork 20

21. The head of a museum is called a
1 musician 2 curator 3 mortician 4 pastor 5 collector 21

22. A six-sided figure is called a
6 pentagon 7 hexagon 8 sextet 9 helix 10 scholium 22

23. The bat is most closely related to the
1 butterfly 2 swallow 3 owl 4 mouse 5 moth 23

24. A character in "David Copperfield" is
6 Tiny Tim 7 Uriah Heep 8 Scrooge 9 Goliath 10 Darnell 24

25. Quinine comes from
1 leaves 2 roots 3 medicine 4 minerals 5 bark 25

Score . . . . .

TEST 6. OPPOSITES

Mark the answer space which has the same number as the word which is OPPOSITE, or most nearly opposite, in meaning to the beginning word of each line.

SAMPLE. north — 1 hot 2 east 3 west 4 down 5 south . . . . . 1 2 3 4 ■

1. exit — 1 emit 2 transcend 3 entrance 4 origin 5 arrival 1
2. amateur — 6 novitiate 7 musical 8 professional 9 inventor 10 experience 2
3. genuine — 1 stolen 2 counterfeit 3 sincere 4 original 5 unworthy 3
4. abundance — 6 liberality 7 frugality 8 luxury 9 hunger 10 scarcity 4
5. alert — 1 illiterate 2 pert 3 sluggish 4 disabled 5 easy 5
6. waste — 6 refuse 7 conserve 8 devastate 9 dole 10 generate 6
7. humiliated — 1 honored 2 refreshed 3 satisfied 4 lively 5 arrogant 7
8. gravity — 6 fragility 7 specificity 8 purity 9 constancy 10 levity 8
9. limitation — 1 explanation 2 encouragement 3 ability 4 freedom 5 speed 9
10. monotony — 6 difficulty 7 diversion 8 harmony 9 repetition 10 variety . . . 10

6

11. obtuse — 1 accessible 2 abstruse 3 acute 4 corpulent 5 agile 11
12. expel — 6 remain 7 propel 8 exile 9 retain 10 contract 12
13. asset — 1 bankruptcy 2 descent 3 misery 4 mortgage 5 liability 13
14. acid — 6 alkaline 7 neutral 8 pepsin 9 briny 10 chemical 14
15. eccentric — 1 particular 2 stupid 3 egocentric 4 ordinary 5 virtuous 15
16. disperse — 6 approve 7 remove 8 gather 9 spare 10 whisper 16
17. wax — 1 pale 2 waive 3 shine 4 age 5 wane 17
18. blithe — 6 helpless 7 cheerless 8 stingy 9 lazy 10 slow 18
19. active — 1 past 2 careless 3 passive 4 pensive 5 dull 19
20. depress — 6 press 7 elate 8 oppress 9 exhort 10 climb 20
21. concede — 1 deny 2 recede 3 finesse 4 usurp 5 resign 21
22. recline — 6 succumb 7 stretch 8 erect 9 stand 10 decline 22
23. invincible — 1 susceptible 2 weak 3 stubborn 4 visible 5 broken 23
24. rash — 6 prudent 7 worthy 8 smooth 9 irrational 10 stringent 24
25. defile — 1 confess 2 file 3 excel 4 purify 5 beautify 25

Score . . . . .

TEST 2. SYNONYMS

Mark the answer space which has the same number as the word which has the SAME or most nearly the same meaning as the beginning word of each line.

SAMPLE. correct — 1 neat 2 fair 3 right 4 poor 5 good .....

1. comic —	1 clumsy	2 laughable	3 universal	4 tricky	5 peculiar	.....	1
2. hazardous —	6 adventurous	7 hard	8 annoying	9 speedy	10 dangerous		2
3. comfort —	1 entreat	2 console	3 pity	4 anger	5 discourage	.....	3
4. equip —	6 decorate	7 establish	8 surround	9 load	10 furnish	.....	4
5. introductory —	1 social	2 advisory	3 transitory	4 preliminary	5 internal	..	5
6. writhe —	6 squeal	7 twist	8 split	9 hurt	10 crawl	.....	6
7. trivial —	1 amusing	2 rare	3 unimportant	4 detailed	5 uneven	.....	7
8. evade —	6 vacate	7 invade	8 shun	9 hide	10 desist	.....	8
9. denounce —	1 beguile	2 detest	3 inform	4 discover	5 condemn	.....	9
10. opposed —	6 censored	7 adverse	8 involved	9 oppressed	10 morose	..	10
11. counsel —	1 quarrel	2 yield	3 advise	4 assemble	5 represent	.....	11
12. abhor —	6 detest	7 fear	8 avoid	9 defy	10 disgust	.....	12
13. depict —	1 vanish	2 slump	3 portray	4 edit	5 fabricate	.....	13
14. expel —	6 repel	7 eject	8 injure	9 expend	10 depart	.....	14
15. encumbrance —	1 contrivance	2 memory	3 burden	4 saddle	5 prison	.....	15
16. docile —	6 facile	7 cozy	8 agile	9 submissive	10 intractable	.....	16
17. quell —	1 inquire	2 dispel	3 instill	4 quest	5 subdue	.....	17
18. abandon —	6 flee	7 escape	8 refuse	9 forsake	10 refrain	.....	18
19. jubilant —	1 exultant	2 judicious	3 playful	4 pleasant	5 jeweled	....	19
20. hoax —	6 danger	7 deception	8 persuasion	9 revelation	10 mischief		20
21. curdle —	1 coagulate	2 spoil	3 snuggle	4 condense	5 churn	.....	21
22. reverence —	6 revenge	7 relevance	8 obedience	9 veneration	10 mercy		22
23. incite —	1 instigate	2 revolt	3 announce	4 disrupt	5 consume	....	23
24. boldness —	6 hypocrisy	7 ferocity	8 audacity	9 frankness	10 confidence		24
25. appease —	1 praise	2 pique	3 entice	4 gladden	5 placate	.....	25

Score .....

TEST 5. ANALOGIES

Ir... below ...y the samples carefully.

SAMPLES.

Ear is to hear as eye is to
1 cry 2 glasses 3 spy 4 wink 5 see .....

Hat is to head as shoe is to
6 arm 7 leg 8 foot 9 fit 10 glove .....

DO THEM ALL LIKE THE SAMPLES.

1. Zoo is to animals as aquarium is to
1 birds 2 fish 3 bees 4 statues 5 butterflies 1
2. Linoleum is to floor as sheet is to
6 cotton 7 piano 8 blanket 9 linen 10 bed 2
3. Food is to hunger as water is to
1 desert 2 thirst 3 quench 4 drink 5 milk 3
4. Add is to subtract as multiply is to
6 arithmetic 7 increase 8 fraction 9 add 10 divide 4
5. Stone is to marble as wood is to
1 brick 2 soft 3 cut 4 oak 5 pile 5
6. Abide is to depart as stay is to
6 play 7 leave 8 away 9 over 10 home 6
7. Author is to book as artist is to
1 painter 2 brush 3 picture 4 easel 5 paint 7
8. You is to yours as me is to
6 his 7 ours 8 mine 9 theirs 10 my 8
9. Singing is to opera as dancing is to
1 masquerade 2 orchestra 3 movie 4 drama 5 ballet 9
10. Shell is to nut as skin is to
6 hull 7 animal 8 white 9 soft 10 cover 10

5→

11. Cub is to bear as gosling is to
1 fox 2 grouse 3 goose 4 rabbit 5 duck 11
12. Liberty is to freedom as bondage is to
6 slavery 7 free 8 suffer 9 serf 10 revolution 12
13. Imitate is to copy as invent is to
1 inventory 2 copyright 3 originate 4 machine 5 patent 13
14. 1 is to 3 as 9 is to
6 *(18)* **7** *(27)* **8** *(36)* **9** *(45)* **10** *(81)* 14
15. Complex is to simple as hard is to
1 tough 2 work 3 easy 4 smooth 5 brittle 15
16. Tree is to forest as person is to
6 women 7 couple 8 human 9 crowd 10 men 16
17. City is to mayor as army is to
1 soldier 2 navy 3 private 4 admiral 5 general 17
18. Wolf is to sheep as cat is to
6 milk 7 fur 8 kitten 9 mouse 10 dog 18
19. $\frac{4}{3}$ is to $\frac{1}{3}$ as 28 is to
1 *(7)* **2** *(14)* **3** *(33)* **4** *(34)* **5** *(43)* 19
20. Hog is to bristles as snake is to
6 fangs 7 scales 8 venom 9 coil 10 rattle 20
21. Seldom is to never as little is to
1 none 2 neither 3 small 4 often 5 large 21
22. Day is to 365 as week is to
6 *(7)* **7** *(31)* **8** *(48)* **9** *(52)* **10** *(60)* 22
23. Corrupt is to depraved as sacred is to
1 hallowed 2 Sunday 3 depressed 4 Bible 5 prayer 23
24. Square is to cube as circle is to
6 round 7 circumference 8 sphere 9 dice 10 line 24
25. Thermometer is to temperature as metronome is to
1 intensity 2 weight 3 distance 4 pressure 5 time 25

Score .....

TEST 3. LOGICAL SELECTION

Mark the answer space which has the same number as the word which tells what the thing ALWAYS has or ALWAYS involves.

SAMPLE. A cat always has
1 kittens 2 spots 3 milk 4 mouse 5 hair

1. An orchestra always has
1 violinists 2 piano 3 musicians 4 saxophone 5 singers
2. A museum always has
6 visitors 7 minerals 8 collections 9 guides 10 paintings
3. School always involves
1 children 2 students 3 arithmetic 4 geography 5 sports
4. A box always has
6 contents 7 wood 8 lid 9 hinge 10 depth
5. Contentment always involves
1 devotion 2 position 3 satisfaction 4 elation 5 recognition
6. A newspaper always has
6 pictures 7 editor 8 puzzles 9 fiction 10 cartoons
7. A wheel always has
1 circumference 2 spokes 3 tire 4 wood 5 metal
8. A policeman always has
6 club 7 cap 8 beat 9 uniform 10 authority
9. A nation always has
1 states 2 colonies 3 seaports 4 laws 5 navy
10. Night always has
6 stillness 7 moon 8 clouds 9 ghosts 10 hours

3→

11. A ship always has
1 engine 2 guns 3 hull 4 passengers 5 freight
12. A message always involves
6 telepathy 7 messenger 8 speech 9 communication 10 writing
13. Discipline always involves
1 revenge 2 anger 3 morale 4 whipping 5 training
14. A bottle always has
6 hollowness 7 label 8 cork 9 glass 10 transparency
15. Anxiety always involves
1 awe 2 grief 3 insomnia 4 uneasiness 5 discouragement
16. Compromise always involves
6 respect 7 friendship 8 adjustment 9 law 10 violation
17. An heir always has
1 money 2 lawyer 3 heirlooms 4 property 5 predecessor
18. An invention always involves
6 usefulness 7 originality 8 patent 9 value 10 imitation
19. A dance always has
1 music 2 partners 3 rhythm 4 audience 5 costume
20. A debt always involves
6 interest 7 creditor 8 mortgage 9 payment 10 worry
21. Rebuke always involves
1 criticism 2 help 3 resignation 4 postponement 5 despair
22. Admiration always involves
6 affirmation 7 generosity 8 flattery 9 esteem 10 love
23. Annihilation always involves
1 surprise 2 destruction 3 pain 4 punishment 5 vengeance
24. Abhorrence always involves
6 aversion 7 rage 8 fear 9 irreverence 10 nausea
25. Ostentation always involves
1 simplicity 2 modesty 3 wealth 4 display 5 perfection

Score

TEST 4. CLASSIFICATION

In each line below, four of the words belong together. Pick out the ONE WORD which does not belong with the others, and mark the answer space bearing its number.

SAMPLES.

1 dog 2 cat 3 horse 4 chicken 5 cow

6 hop 7 run 8 stand 9 skip 10 walk

1. 1 Catholic 2 Methodist 3 Presbyterian 4 Republican 5 Baptist
2. 6 damp 7 wet 8 moist 9 soggy 10 soft
3. 1 telegraph 2 train 3 automobile 4 bicycle 5 boat
4. 6 often 7 seldom 8 safely 9 always 10 rarely
5. 1 oats 2 rye 3 wheat 4 clover 5 barley
6. 6 cello 7 harp 8 drum 9 violin 10 guitar
7. 1 Scottie 2 Holstein 3 Collie 4 Shepherd 5 Spitz
8. 6 digestion 7 smell 8 sight 9 hearing 10 taste
9. 1 pepper 2 cinnamon 3 nutmeg 4 pickle 5 mustard
10. 6 chapel 7 temple 8 tabernacle 9 cathedral 10 casino

4→

11. 1 reason 2 pity 3 joy 4 anger 5 fear
12. 6 arithmetic 7 geometry 8 history 9 trigonometry 10 algebra
13. 1 mosquito 2 ladybug 3 gnat 4 snail 5 beetle
14. 6 grosbeak 7 swallow 8 oriole 9 lark 10 gazelle
15. 1 nail 2 brad 3 awl 4 staple 5 tack
16. 6 large 7 tall 8 high 9 short 10 low
17. 1 priest 2 organist 3 minister 4 rabbi 5 bishop
18. 6 devotion 7 adoration 8 reverence 9 avarice 10 admiration
19. 1 pine 2 fir 3 maple 4 cedar 5 spruce
20. 6 Christ 7 Caesar 8 Moses 9 Mohammed 10 Confucius
21. 1 hither 2 recent 3 whence 4 near by 5 down
22. 6 lead 7 brass 8 iron 9 tin 10 copper
23. 1 verdict 2 testimony 3 subpoena 4 court 5 evidence
24. 6 inherit 7 lend 8 beg 9 borrow 10 earn
25. 1 moreover 2 besides 3 also 4 furthermore 5 however

Score .....

TERMAN–McNEMAR TEST OF MENTAL ABILITY

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Stanford University, California

and QUINN McNEMAR
Stanford University, California

MANUAL OF DIRECTIONS

I. DESCRIPTION OF THE TESTS

The Terman Group Test of Mental Ability, which was first published in 1920, was not only one of the earliest group tests but also one of the first tests based upon an item analysis. Perhaps its fundamental soundness is indicated by its widespread and continued usage — more than 11,000,000 copies have been distributed during the period 1920–1941. This test has now been completely revised and will be known hereafter as the Terman-McNemar Test of Mental Ability.

The test is designed primarily for use in Grades 7 through 12, although it may be used also in Grade 6 and with first-year college students. There are two forms, C and D, each composed of seven subtests and 162 items.

The several considerations which have led to and influenced the revision should make the new forms definitely superior to the original. The changes may be briefly mentioned here. (1) Two-choice questions have been eliminated in favor of the more reliable multiple-choice type with five alternatives except for the Best Answer test, which has four. (2) The revised forms are so designed as to permit more rapid scoring by a perforated key;[1] they may also be used with separate answer sheets for scoring on the International Test Scoring Machine. (3) More homogeneous material has been used in order to have a test more highly saturated with a common factor or ability. Thus, the exclusion of the arithmetical and numerical subtests means that the scores of any two individuals are more nearly comparable qualitatively; i.e., they lie along the same continuum. This continuum may be characterized as that of general verbal intelligence. This particular change has, of course, been prompted by recent developments in factor analysis. (4) Instead of ten subtests, each form of the new test contains seven: Information, Synonyms, Logical Selection, Classification, Analogies, Opposites, and Best Answer. It will be noted that Sentence Meaning, Mixed Sentences, Arithmetic, and Number Series have been dropped, and that the former Same-Opposites test has been replaced by two subtests, Synonyms and Opposites. (5) An attempt has been made to use equivalent materials in the two forms, and within each subtest the use of a word either as a stimulus or response more than once has been reduced to the vanishing point.

[1] The arrangement for scoring is covered by Patent No. 1,586,628 originally taken out by Charles A. Lauterbach.

II. CONSTRUCTION OF THE TESTS

Item analysis. In constructing the new forms, as many of the items from the old forms as could be made suitable by revision were utilized. Additional items were made up until enough were available, after critical examination by seven competent persons and after careful editing, for three experimental forms of the same length and general make-up as the present Forms C and D. These forms were administered to experimental groups in Grades 7, 9, and 11, each pupil taking all three forms and practice effect being taken care of by rotation in the order of administration. Ample time limits were allowed for even the slowest. Enough pupils were tested so as to yield 400 cases, with complete data, for each grade. The results for these 1200 pupils were used as the basis of the subsequent item analysis.

On the assumption that the validity of an item depends partly upon the extent to which it differentiates between groups of different maturity levels, those items were eliminated which did not show successive increments from Grades 7 to 9 to 11, in the percentages giving correct responses. The per cent passing a test item was considered as the item difficulty for each grade. The average per cent passing an item for the three grades was used as the final measure of item difficulty. As a further basis for eliminating the less valid and unsatisfactory items, the tetrachoric correlation of each

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item with the total score based on all three test forms was computed for each grade separately. Three such coefficients were available for all items except those which were so easy for the 11th grade and the ones so difficult for the 7th grade as to yield dichotomies too extreme for stable tetrachoric correlation coefficients. The average tetrachoric for the three grades was taken as the final item validity or measure of internal consistency. Items yielding low average validity coefficients were eliminated from further consideration. No item was retained which yielded an average tetrachoric correlation of less than .30, and only 10 per cent of the final items have validities of less than .40. The average coefficient for all retained items was .53.

The final allocation of the items to the two forms was made on the basis of item difficulty and item validity, the items within each subtest and for the total test being matched in the two forms for difficulty and validity indices. The respective averages of all the difficulty values for Forms C and D were 56.24 per cent and 56.26 per cent, while those of the validity coefficients were .5308 and .5307. Since the matching also produced highly similar distributions of difficulty indices and distributions of validity coefficients for the two forms, the statistical comparability of Forms C and D has been assured.

The items within each subtest have been arranged in the order of difficulty indicated by the difficulty indices. This fact, coupled with ample time allowance for each subtest, means that the new forms, like the old, are essentially power tests — any pupil who has not finished a subtest within the set time limit would not likely increase his score if given additional time. The time needed for administering either form, including time for directions, is about 48 minutes.

Perhaps a word should be said here for the benefit of the non-statistically-minded test user. If the types of subtests included in the Terman-McNemar revision are acceptable as valid measures of important mental abilities, a matter that is hardly open to debate in view of the abundance of experience favoring this assumption, then the above data are convincing evidence of the essential soundness of the content of the new tests.

Comparability of old and new forms. When an established test such as the Terman Group Test of Mental Ability is revised and new norms established, it is essential to provide the means by which the scores on the original test can be interpreted in terms of the new norms. To be able to do this, it is necessary to determine the equivalence of scores on the old and new tests. To establish this equivalence, a carefully controlled equating experiment was carried out involving the administration of old Form A and new Form C to all students in Grades 7 through 12 in Portsmouth, New Hampshire. Approximately 1400 cases spread fairly equally over the grade range were included in this study. Practice effect was equalized by giving Form A first to a random half of each grade group; the remaining pupils took Form C first. A few days later the second test was given. Those who took Form A at the time of the first testing now took Form C, and vice versa. On the basis of these data the equivalent raw scores on the old and new tests were determined. These data are summarized in Table 5, with the exception that standard scores on the new test have been substituted for raw scores.

Comparability of the new forms. As indicated earlier, new Forms C and D were paired for difficulty in terms of the average per cent passing each item. As a final check on the equality of forms and also to determine reliability coefficients, another controlled rotated group experiment was carried out. The testing was done in Concord, New Hampshire, and approximately 1500 students in Grades 7, 9, and 11 were included. The analysis of these data showed the two forms to be completely comparable throughout the range of scores.

Reliability. The reliability of a test is the stability of the measures it yields. A completely unreliable test would be one which yielded measures so variable that just as good results could be obtained by drawing lots; a completely reliable test would be one in which a single application of the instrument yielded the individual's "true" score. Reliability is a function of the test itself — that is, the number and kind of items presented to the person being tested under standard conditions. It has nothing to do with the norms established for the test. In other words, a completely reliable test might give misleading results if the norms were improperly established.

Various methods of expressing the reliability of a test are in common use. Three of the commonest are the split-half reliability coefficient, the interform reliability coefficient, and the probable error of a test score. All three methods have distinct advantages and all three methods have been employed in the case of the Terman-McNemar Test of Mental Ability for the sake of completeness.

1. The split-half method. The split-half reliability coefficient is obtained by scoring all the odd-numbered items and all the even-numbered items separately. By doing this the test is broken into two parts which are presumably equal in every sense. Even the effects of fatigue, ennui, and

practice are evenly shared under these circumstances. The two scores thus obtained are then correlated, and the obtained coefficient is "corrected" by means of a statistical formula to estimate the reliability coefficient of the full-length test.

2. The inter-form method. In the case of the inter-form reliability coefficient two presumably equivalent forms of the test are given to the same children, with an interval varying from one day to a fortnight between the testing periods. The obtained scores on the two tests are then correlated to find the reliability coefficient. It is readily seen that reliability coefficients obtained in this manner are influenced by the equivalence of the two test forms (not in the sense of difficulty, but in the sense of comparable content) and the variations in the total environment including the person tested. Consequently, the inter-form reliability coefficient is almost always lower than the corrected split-half reliability coefficient. On the other hand, it has the virtue of representing with more veracity the situation which the practical school administrator most often faces — namely, the question of how much variation (not due to practice) must be expected when a different form of a test is used.

Both types of reliability coefficients are difficult for the novice to interpret. They vary in accordance with the range of talent tested, and unless the group on which the coefficients are based is clearly specified, the coefficients themselves are of doubtful significance. Perhaps the most unambiguous population on which to base such coefficients is a random sample of a single age group. The split-half reliability coefficient for the Terman-McNemar Test of Mental Ability was .96 when determined on 279 cases in Grades 7 through 9 in the carefully controlled experiment in Portsmouth, New Hampshire, in which Forms A and C were equated. The inter-form reliability was .95 when determined on 239 cases in Grades 7 and 9 in the Concord, New Hampshire, experiment in which Forms C and D were equated. When the reliability coefficients so obtained are corrected for range to give the coefficient for age 14 (13–6 to 14–5) which was basic in setting up the standard score scale, the reliability by both methods is .96. The reliability coefficients for the other age ranges were checked and found to vary only slightly from the 14-year value.

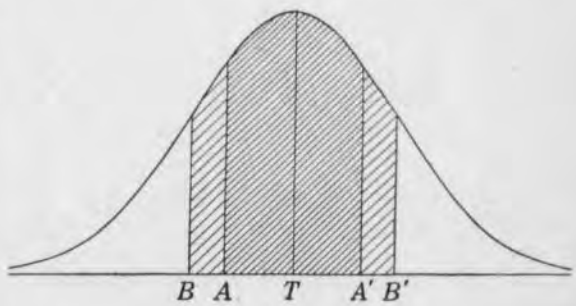
3. Probable Error of Measurement. The third method of reporting the reliability of a test is to give the Probable Error of Measurement.[1]

[1] The P.E.$_M$ is given by the formula P.E.$_M$ = $.6745\sigma_1\sqrt{1 - r_{11}}$, where σ_1 = the standard deviation of the obtained distribution of scores and r_{11} is the reliability coefficient. To obtain a better idea of the meaning of this value, one must realize that an individual's "true" score is never known from a single application of any test.

One advantage of the Probable Error of Measurement is that it is independent of the range of talent upon which it is based, whereas the reliability coefficient is not. Another is that it makes it possible for us to estimate whether the difference between any two scores is a statistically reliable difference. The Probable Error of Measurement for the Terman-McNemar Test of Mental Ability is approximately 2.2 standard score points for the entire age range covered by the test.

Validity. In the early days of the development of group tests of mental ability an attempt was made to validate them by correlating the scores with teachers' marks. As has been pointed out many times in the intervening years this procedure is unsatisfactory because of the serious shortcomings in teachers' judgments of mental ability. The best evidence of the validity of the Terman test is to be found in its successful use over the period of years since the test was first issued. Many instances may be cited where the Terman test has been used with great success in guidance and administration. In some situations where the use of the Terman test with entering high school students has been made a standard practice, it has been found that year after year those students who were

The "true" score is the average of an infinite number of test scores derived by repeated applications of a test to the same individual, assuming no practice effects. It is obvious that such a "true" score can never be obtained in actual practice. The Standard Error of Measurement is an estimate of the standard deviation of a distribution of such theoretical scores for a given individual. It is valuable because it gives us some idea of the fluctuation which we can expect in obtained scores due to random errors. In the following graph the curve represents a distribution of the obtained, fallible test scores around the "true" score, *T*, of an individual.



The distance *TB* or *TB'* represents the standard deviation of this theoretical distribution. This is the *Standard* Error of Measurement. The distance *TA* or *TA'* represents the *Probable* Error of Measurement, which is .6745 times the Standard Error. Fifty per cent of the scores in such a distribution would fall between plus and minus 1 PE. The most probable position in such a distribution for any obtained score is at the mean; as one moves outward toward the tails of the distribution the likelihood that the obtained score would fall at any given point decreases rapidly. Although it is not strictly accurate, it is helpful to say that the chances are 50–50 that an obtained score will fall somewhere between points *A* and *A'*, or 68 in 100 that it will fall between *B* and *B'*. Any error in such a statement is on the side of conservatism.

graduated with honors were those who made scores in the highest range of the test. The correlation of the revised test with the original test is .91, which indicates that the new test can be considered to be measuring essentially the same basic abilities covered by the original forms.

If one is willing to admit that the abilities measured by this test as a whole are important abilities for success in school and, to a certain lesser degree, in life, then it becomes reasonable to talk about the validity of the component parts of the test. Evidence regarding this has already been presented in the section on the construction of the test, where it was pointed out that 90 per cent of the items had tetrachoric correlations with the total test of .40 or over and the average tetrachoric on both forms was .53.

III. Standardization

The standard score scale. In order to have adequate mental or educational measurement, a score scale must have (1) a single origin and (2) comparable units in all parts of the scale. It is generally recognized that raw scores do not insure comparability at all points along a scale. A difference of ten raw score points in one part of a scale may represent a different amount of ability from ten raw score points in another part of the scale. Similarly, a difference of ten raw score points at an early age may represent quite a different amount of intellectual growth from ten raw score points at a later age. For the Terman-McNemar Test of Mental Ability, a standard score scale has been devised which uses the median of the 14-year age group of the national standardization population as the origin and the standard deviation of this age group, arbitrarily made 16 points, as the unit of measurement. Scores on this scale for all age groups are thus measured from a single origin and provide comparable units throughout all parts of the scale.

After examining the distributions of raw scores for all ages, age 14 was chosen as the most unselected group for such scaling. Age 14 included 1615 cases from 13 years 6 months to 14 years 5 months inclusive; this was a 10 per cent random sample of the national population tested. Practically all the children of this age should be in the grade range tested; i.e., Grades 6 through 12. The total raw scores for this age group were distributed and the cumulative per cents getting respective raw scores were plotted on Otis Normal Percentile Charts [1] which made it possible very quickly to convert the raw scores into standard scores which would yield a normal distribution. The standard score equivalents of the raw scores were read from the chart, assuming a standard deviation of 16 for the standard scores at age 14 and arbitrarily calling the median of the 14-year-olds a standard score of 100. (The raw score standard deviation for age 14 was 26.74; the raw score median for this age was 76.00.) This gives a single standard score scale measured from the median of the 14-year-olds in units of the standard deviation of the 14-year-olds which can be used for the whole range of the test. The underlying assumption of such a scale is that the distribution of the scores in the abilities tested would be normally distributed in an unselected population if you had equal units in all parts of the scale. The stability of the standard scores so determined should be assured, since they were determined on a 10 per cent random sample out of a total population of 16,000 14-year-old students in all parts of the United States.

Establishment of norms. Norms for the Terman-McNemar Test of Mental Ability have been determined in the customary way; i.e., by finding the median standard score for successive age groups, plotting standard score against age, and drawing a smoothed norm line through the plotted points. Corrections for selection were made for ages 11, 12, 17, 18, and 19 before this norm line was drawn. About one half of the communities in the national standardization program furnished information on per cent of drop-outs during the period 1934–1941 in their schools, to aid in making such a correction. From this corrected norm line representing unselected age populations, mental ages corresponding to months of chronological age from 10 years 0 months to 19 years 11 months were determined. These mental age norms are presented in Table 2.

The norms for this test were established through a cooperative national testing program sponsored by World Book Company in which approximately 190,000 tests were distributed to 200 [1] communities in 37 states and 307 parochial schools in the diocese of Philadelphia. To facilitate calculations, only a 10 per cent random sample of the test booklets was called in for setting up the norms. To insure the randomness of such a sample, communities were not notified of the serial numbers to be returned

[1] These Normal Percentile Charts proved extremely helpful in many phases of the statistical work involved in the Terman-McNemar standardization. The Chart and its uses are described in the Manual of Directions for the Otis Normal Percentile Chart and in Test Method Help, No. 4, Statistical Methods Applied to Test Scores, both published by World Book Company.

[1] Not all communities returned their tests in time to be included in the normative population. The norms are based on the results from 148 communities in 33 states where answers were recorded in the test booklets; data from the remaining communities including several communities where answers were recorded on separate answer sheets are in the process of analysis.

until after the tests were administered and scored. Each community tested all of the pupils in at least three consecutive grades in order to obtain at least one approximately unselected age sample from it. About one half of the communities tested more than three grades while one fourth of them tested the whole grade range. The 10 per cent random sample of test booklets was returned to World Book Company where all scoring and the calculation of chronological ages from verified birth dates were checked before the data were punched in Hollerith cards. Distributions of raw scores for separate age groups were run off; these were the basic data for setting up the standard score scale and the norms. The wide geographical distribution of the coöperating communities and the fact that all students in at least three consecutive grades were tested in each community should insure a cross section of the school population in the grades involved in the norms.

IV. General Directions for Administering

The test should be given in a room where a quiet atmosphere prevails both within and without. It should be administered as if it were an interesting lesson or activity, but without preliminary counsel by the teacher or examiner. Any influences which might cause tenseness and anxiety should be carefully avoided. Provision should be made to guard against interruptions of any kind. Some examiners post on the door a card reading, "Examination. Keep out!" It is best that each pupil have two sharpened pencils and an eraser and that an extra supply of pencils be on hand in case of need.

To obtain reliable results, the examiner should read the entire contents of these directions and be wholly familiar with them before attempting to give the test. The wording of the directions has been given careful study. It is intended that the directions be precise enough for all children to understand what they are to do; the person administering the test should follow these directions exactly.

Time limits are provided for the separate subtests. They should be adhered to within a margin of a few seconds. A regular watch will serve for timing; a stop watch is unnecessary. The examiner should not permit the idea of time limit to create a feeling of pressure or nervousness on the part of the pupils. What is desired is each child's best response to the test. The time limits on this test are intentionally generous, as it was the desire of the authors to make this a power test rather than a speed test. Consequently it may sometimes occur, especially in above-average groups, that an entire class will finish a subtest before the time for it has expired. In such a situation the examiner should continue with the directions for the next subtest.

V. Specific Directions for Administering

Each of you will be (or has been) **given a test booklet. Don't open the test booklet until told to do so. Fill in your name and the other blanks on the front page of the booklet.** (Pause for about 1½ minutes.)

If the regular edition is being used, say:

Attention! Listen carefully. I want you to understand the directions so that you can make a high score. Let us now look at the front page in order to see how the answer spaces should be marked to indicate the correct answers.

If the separate answer sheet for machine scoring is being used, substitute the following for the paragraph above:[1]

Each of you will be (or has been) **given a test booklet and a separate answer sheet.** ***Do not make any marks on the test booklets.*** **Fill in your name and the other blanks on the front side of the answer sheet.** (Pause for about 1½ minutes.)

Attention! Listen carefully. I want you to understand the directions so that you can make a high score. Now take your answer sheet and slip it under the edge of the test booklet so that the column of answer spaces on the right-hand side of the answer sheet marked SAMPLES is alongside the front page like this. (Show by holding up a test booklet with the answer sheet in the correct position.) **The arrows in the SAMPLES column of the answer sheet should point directly toward the arrows on the test booklet.**

After making sure that every one has properly articulated his test booklet and answer sheet, continue with the regular directions.

Look at the first example: "Steel is made from lead, iron, tin, copper, zinc." The correct answer, ***iron,*** **is number 2; so the second answer space has been blackened. Now you mark the correct answers for the remaining samples in the same way. A horse always has** (Pause) ***hoofs;*** **so blacken the space numbered 9. A quart is one fourth of a** (Pause) ***gallon;*** **so blacken the 1st space.**

In taking this test, you are first to decide which answer is correct, and then blacken with a ***soft pencil*** **the answer space which is numbered the same as your choice for the correct answer. Make your mark as long as the pair of lines, and move the pencil up and down firmly to make a heavy black line. If you change your mind, erase your first mark completely.**

[1] It is assumed that the group has had previous experience in marking machine-scored answer sheets; if this is not the case, a practice test should be given first. Furthermore, we strongly recommend that the special pencils using the electrographic lead be used for marking the answer sheets to insure accurate machine scoring.

There is a row of answer spaces for each question. Be sure that the space you mark is in the proper row. If you omit a question, be sure to skip its row of answer spaces.

Now open the booklet to Test 1. Let us read the directions: "Mark the answer space which has the same number as the word that makes the sentence true, as shown in the sample." (Pause.) **Ready — GO.**

After 6 minutes, at ____ o'clock,[1] say: **STOP. Turn the page to Test 2. Let us read the directions: "Mark the answer space which is numbered the same as the word which has the same or most nearly the same meaning as the beginning word of each line, as shown in the sample."** (Pause.) **Ready — GO.**

After 6 minutes, at ____ o'clock,[1] say: **STOP. Turn the page to Test 3. Let us read the directions: "Mark the answer space which has the same number as the word which tells what the thing always has or always involves, as shown in the sample."** (Pause.) **Ready — GO.**

After 6 minutes, at ____ o'clock,[1] say: **STOP. Turn over the page and turn the booklet around to Test 4.**

*If the separate answer sheet is being used, say, "**Turn the answer sheet over to the column at the right marked Test 4. Be sure that the arrows on the test booklet point directly to the arrows on the answer sheet.***

Let us look at the directions: "In each line below, four of the words belong together. Pick out the one word which does not belong with the others, and mark the answer space bearing its number, as shown in the two samples." (Pause.) **Ready — GO.**

After 6 minutes, at ____ o'clock,[1] say: **STOP. Turn to Test 5. Study the two samples carefully.** (Longer pause.) **Ready — GO.**

After 6 minutes, at ____ o'clock,[1] say: **STOP. Turn to Test 6. Let us read the directions: "Mark the answer space which has the same number as the word which is opposite, or most nearly opposite, in meaning to the beginning word of each line, as shown in the sample."** (Pause.) **Ready — GO.**

After 6 minutes, at ____ o'clock,[1] say: **STOP. Turn to Test 7. Read each statement and mark the answer space which has the same number as the answer which you think is best, as shown in the sample.** (Pause.) **Ready — GO.**

After 4 minutes, at ____ o'clock,[1] say: **STOP. Close your booklet.** Collect the papers immediately.

If the separate answer sheet for machine scoring is being used, collect the test booklets, telling the pupils to retain the answer sheets. Then tell the pupils to go over each mark on the answer sheet, making a black shiny mark, and to erase any stray marks not intended for correct answers.

[1] Unless a stop watch is used, write the finishing time for each test in the space provided; e.g., 10:06.

VI. Directions for Scoring

The need for accuracy in the scoring of standardized tests cannot be overemphasized. All scoring should be checked, especially if the test results are to be used for individual guidance.

Each operation in the scoring should be made as nearly mechanical as possible. The most efficient scoring is done when the process becomes very nearly automatic.

The Terman-McNemar Test is scored by means of a patented scoring arrangement which does away with the necessity of marking with pencil each item right or wrong. To score a test booklet, a perforated scoring key (which is included in each package of tests) is positioned successively over the answer spaces for each of the subtests. When the key is properly placed, only the correct answers appear through perforations in the key.

The specific steps to follow in scoring are:

1. Open the test booklet to Test 1. First scan the answer spaces rapidly to note any items which are double marked. The pupils have been instructed to put only one mark in any row of spaces, but occasionally there will be found two or more marks. Wherever two or more answer spaces for one question have been marked in spite of the precise directions, the spaces should be crossed through with a colored pencil so that an answer correct only by chance will not receive credit.
2. Superimpose the key for Test 1 on the Test 1 answer spaces so that the heavy black arrow in the center of the right-hand margin of the test page shows through the large opening in the center of the proper column of the key and the arrows on the test booklet and the key are point to point, as illustrated: **1➔➔1**. Adjust the key with a slight rotary motion so that the answer spaces on the test paper show through the perforations of the key. This is quickly done after short practice.
3. Count the number of correct responses — i.e., the number of black marks that appear through the openings of the key. The number of correct responses is the score. Record this score in the space provided at the foot of the page, preferably with a colored pencil.
4. Each of the subtests should be scored in exactly the same way. In each case the score — i.e., number right — should be recorded in the space provided at the foot of the test page.
5. To insure accuracy, it is highly desirable to have all papers rescored, preferably by a

second person working independently. If this is not possible, it is wise to rescore those tests on which the scores fall in the lowest 25 per cent of the group.

6. Transfer the raw scores to the grid on the title page and sum them to obtain the total score.

VII. Special Directions for Machine Scoring

It is assumed here that all persons attempting to score the Terman answer sheet on the International Test Scoring Machine will have thoroughly familiarized themselves with the scoring techniques described in the various International Business Machines publications, particularly as they concern the manipulation of the machine itself. To insure scoring of satisfactory accuracy, the following steps are suggested:

1. Be sure that the machine is properly adjusted according to the manufacturer's directions.
2. Scan each answer sheet for double-marked items and for stray pencil marks which might affect the score. Double-marked items should be completely erased, as should any stray marks, no matter how slight, which fall within the sensing spaces. If answer sheets are badly marked up, it is easier to score them by hand than to adequately scan and clean them.
3. As the answer sheets are being scored on the machine, a check scorer should rescore a certain proportion of the sheets by hand. It is suggested that the check scorer work along with the machine operator, rescoring a random selection of the papers as they come from the machine.
4. The raw scores may be entered directly on the Class Record in the columns provided for this purpose. The total raw scores (number right) may be translated into standard scores from the table given at the right-hand side of the Class Record blank; these standard scores may be recorded in the proper column of the Class Record blank.

VIII. Interpretation of Scores

Need for means of interpretation. Raw scores on a test, that is, the number of items a pupil is able to answer correctly, have only limited meaning. They serve to arrange the individuals who have taken the test in rank order, but for all practical purposes this is the limit of their usefulness. For example, it is not possible to compare raw scores on one test with raw scores on another, even though both tests have the same number of items. As a general rule, raw scores are not even comparable from one part of the range of scores to another. For example, the difference between a score of 5 and a score of 10 is not the same as the difference between a score of 50 and a score of 55. Because of this lack of comparability, it is necessary to interpret the raw scores in some way. Traditionally, raw scores on intelligence tests have been interpreted in terms of mental ages and IQ's.

Disadvantages of traditional mental ages and IQ's. While mental ages and IQ's represent a definite step forward in comparison with total score as a means of interpreting test results, they have, especially at the upper age levels, some very serious disadvantages which are not always appreciated. Let us first consider mental ages.

A mental age is the age for which a given intelligence test score is the norm or average. Our first limitation grows out of the fact that most intelligence tests are applicable only over a very narrow range of ages. For example, the Terman-McNemar test is primarily intended to be used with pupils from 12 to 18 years inclusive. In standardizing the test, the grade range tested was extended downward one grade below the usual grades in which this test is used. Even so, mental ages can be taken literally from the data only for this limited range; values above and below these points must be determined by extrapolation, that is, by arbitrarily extending the line of relation between score and age. This may not be serious if data to supplement the test scores for lower and higher age groups are available, making it possible to estimate what the average score of these more extreme ages would be. However, really adequate information of this sort is rarely obtainable. The seriousness of this limitation is not truly appreciated until one realizes that a very small proportion of the total range of scores on a test will fall between the average score of the lowest and that of the highest age for which unselected groups are available. For example, the average score of 12-year-old children in terms of number right on the Terman-McNemar test is 59, while the average score for 16-year-old children is 93. The difference between these two values, or 34 points of score, represents only a little over one fifth of the total range of raw scores on the test. In other words, nearly four fifths of all of the scores on the test would have mental ages assigned by extrapolation.

There is another even more serious difficulty. Mental ages do not represent comparable units from one part of the scale to another. An essential condition for equality of mental age units would be that the increment in score in terms of some truly equal scale should be the same from one age to another. Whenever test scores having some

claim to comparability are plotted against age, the resulting line is not straight, but tends to bend off with a characteristic negative acceleration. This norm line or growth curve reaches a maximum at some point in the upper teen ages or early twenties, but just where this maximum occurs is practically impossible to determine because of the difficulties in testing unselected groups of individuals in the upper teen age and young adult level.

Let us consider now some of the disadvantages of the traditional ratio IQ which is obtained by dividing the mental age by the chronological age. Theoretically, one of the chief virtues of the IQ is its constancy. Actually, however, for the IQ to be constant, certain conditions must be fulfilled which in actual fact rarely do obtain. In the first place, the increase in score in terms of absolute units must be equal from one age to another. We can see how absurd such an assumption is if we realize that it assumes mental power increasing at a constant rate with increasing chronological age throughout the lifetime of an individual. This of course is quite contrary to our practical experience. It is just as normal for individuals to reach a maximum of their mental powers as to reach a maximum of physical stature. Thus we are reduced to the dilemma that the IQ, defined as the ratio of MA/CA, cannot be constant unless the increment in score from one age to another is constant, and the increment in score in terms of any absolute units cannot be constant without assuming the absurd situation of mental growth continuing at a constant rate throughout the lifetime of an individual.

However, there is another equally serious limitation in the IQ. The magnitude of the IQ will vary from one test to another, as the test content differs. It seems reasonably well established now on the basis of experimental evidence that there are various aspects of mental ability. The rate of growth and the level at which the individual reaches maturity is not the same for all mental traits. This is reflected in the different relation of absolute scores to age from one test to another, which depends upon the composition of the test. Another way of stating the same thing is to say that the correlation of the scores on a test with chronological age will differ from one test to another. The magnitude of the IQ is directly affected by the amount of this correlation with a result that IQ's for two different tests cannot be assumed to be comparable unless we know that the correlation of the scores for the two tests with chronological age is the same.

Methods of interpretation recommended. Scores on the Terman-McNemar Test may be interpreted in any one of four different ways. These are:

1. Normalized standard scores
2. Mental ages
3. Deviation IQ's (ratio IQ's can be computed, but are not recommended)
4. Percentile ranks corresponding to IQ's.

One or more of these methods of interpreting raw scores will need to be used, depending upon the purpose of giving the test. After we have discussed in detail how these values are to be derived, some attention will be given to the various uses to which each one may be put.

Normalized standard scores. Standard scores are derived directly from the "number right" at the

TABLE 1

STANDARD SCORE EQUIVALENTS OF RAW SCORES ON THE TERMAN-MCNEMAR TEST OF MENTAL ABILITY: FORMS C AND D

Raw Score	Stan. Score	Raw Score	Stan. Score	Raw Score	Stan. Score	Raw Score	Stan. Score
0	30	40	77	80	103	120	124
1	31	41	77	81	103	121	125
2	33	42	78	82	104	122	125
3	34	43	79	83	104	123	126
4	35	44	80	84	105	124	127
5	37	45	81	85	105	125	127
6	38	46	82	86	106	126	128
7	39	47	82	87	107	127	128
8	40	48	83	88	107	128	129
9	42	49	84	89	108	129	130
10	43	50	85	90	108	130	130
11	44	51	86	91	109	131	131
12	45	52	87	92	109	132	132
13	47	53	87	93	110	133	133
14	48	54	88	94	110	134	133
15	49	55	89	95	111	135	134
16	50	56	89	96	111	136	135
17	51	57	90	97	112	137	135
18	53	58	90	98	112	138	136
19	54	59	91	99	113	139	137
20	55	60	91	100	113	140	138
21	56	61	92	101	114	141	139
22	57	62	92	102	114	142	140
23	58	63	93	103	115	143	141
24	60	64	94	104	115	144	142
25	61	65	94	105	116	145	143
26	62	66	95	106	116	146	145
27	63	67	96	107	117	147	146
28	64	68	96	108	117	148	147
29	65	69	97	109	118	149	148
30	66	70	97	110	119	150	149
31	67	71	98	111	119	151	151
32	69	72	98	112	120	152	152
33	70	73	99	113	120	153	153
34	71	74	99	114	121	154	155
35	72	75	100	115	121	155	156
36	73	76	100	116	122	156	158
37	74	77	101	117	122	157	159
38	75	78	102	118	123	158	161
39	76	79	102	119	124	159	163

time the scores are entered on the Class Record. This is done by means of the table which appears in the right-hand margin of the Class Record. The same values also appear in Table 1 of the Manual. Number right should always be translated into standard score as there is no purpose served by raw scores which cannot be better served by standard scores.

Mental ages. Table 2 gives the age for which each of the given standard scores is the norm or average.

TABLE 2

NORMS FOR TERMAN-McNEMAR TEST OF MENTAL ABILITY

Months	Years 10	11	12	13	14	15	16	17	18	19
0	77	84	90	95	100	105	109	113	117	120
1	78	85	91	96	101	105	110	114	117	120
2	78	85	91	96	101	106	110	114	117	120
3	79	86	92	97	102	106	110	114	118	121
4	79	86	92	97	102	107	111	115	118	121
5	80	87	93	98	102	107	111	115	118	121
6	81	87	93	98	103	107	111	115	118	121
7	81	88	94	98	103	108	112	116	119	122
8	82	88	94	99	104	108	112	116	119	122
9	82	89	94	99	104	108	112	116	119	122
10	83	89	95	100	104	109	113	116	119	122
11	83	90	95	100	105	109	113	117	120	123

These ages are mental ages in the sense in which this term is ordinarily defined. Through the major part of the age range for which the test applies, namely ages 13–16 inclusive, the age equivalents are based entirely upon data obtained in the national standardization program. Above and below these ages the norm line has been corrected to allow for known selection; the corrected values represent the best possible estimate of the true average score which would be obtained by unselected groups of individuals at the given ages. Not every standard score has an age equivalent, as this would involve extrapolating the norm line beyond limits for which adequate data are available. Age values have been given for all ages for which the test applies; higher and lower age values are not given since they would have no possible usefulness except for the computation of ratio IQ's, which are not recommended.

Deviation IQ's. Basically, the procedure for computing deviation IQ's requires that the difference be found between the obtained standard score and the average standard score for other individuals of the same age. This difference or deviation is then interpreted directly in terms of IQ from Table 3. This can be done because both IQ's and the normalized standard scores are distributed normally. For ages 13, 14, and 15, the relation between IQ and standard score is on a 1-to-1 basis. In other words, the IQ for any individual falling between 13–0 and 15–11 may be found by adding or subtracting his deviation-of-score-from-the-norm to or from 100.

A method has been provided by means of carefully spaced tables, whereby the IQ may be obtained

TABLE 3

DEVIATION IQ'S CORRESPONDING TO GIVEN DEVIATIONS OF STANDARD SCORE FROM THE NORM

Deviation	Deviation IQ's for Ages 10, 11, 12	13, 14, 15	16 and above
80	161	150	144
79	160	149	144
78	159	148	143
77	158	147	142
76	157	146	141
75	155	145	140
74	154	144	139
73	153	143	138
72	152	142	137
71	150	141	136
70	149	140	136
69	148	139	135
68	147	138	134
67	145	137	133
66	144	136	132
65	143	135	131
64	142	134	130
63	141	133	129
62	139	132	128
61	138	131	128
60	137	130	127
59	136	129	126
58	134	128	125
57	133	127	124
56	132	126	123
55	131	125	122
54	129	124	121
53	128	123	120
52	127	122	120
51	126	121	119
50	125	120	118
49	123	119	117
48	122	118	116
47	121	117	115
46	120	116	114
45	118	115	113
44	117	114	112
43	116	113	112
42	115	112	111
41	113	111	110
40	112	110	109
39	111	109	108
38	110	108	107
37	109	107	106
36	107	106	105
35	106	105	104
34	105	104	104
33	104	103	103
32	102	102	102
31	101	101	101
30	100	100	100
29	99	99	99
28	97	98	98
27	96	97	97
26	95	96	96
25	94	95	96
24	93	94	95
23	91	93	94
22	90	92	93
21	89	91	92
20	88	90	91
19	86	89	90
18	85	88	89
17	84	87	88
16	83	86	87
15	82	85	87
14	80	84	86
13	79	83	85
12	78	82	84
11	77	81	83
10	75	80	82
9	74	79	81
8	73	78	80
7	72	77	79
6	70	76	79
5	69	75	78
4	68	74	77
3	67	73	76
2	66	72	75
1	64	71	74
0	63	70	73
−1	62	69	72
−2	61	68	71
−3	59	67	71
−4	58	66	70
−5	57	65	69
−6	56	64	68
−7	54	63	67
−8	53	62	66
−9	52	61	65
−10	51	60	64
−11	50	59	63
−12	48	58	63
−13	47	57	62
−14	46	56	61
−15	45	55	60
−16		54	59
−17		53	58
−18		52	57
−19		51	56
−20		50	55

TABLE 4

PERCENTILE RANK CORRESPONDING TO IQ

IQ	%-ILE
150	99.9
149	99.8
148	99.8
147	99.8
146	99.7
145	99.7
144	99.6
143	99.6
142	99.5
141	99.4
140	99.3
139	99.2
138	99
137	99
136	99
135	98
134	98
133	98
132	98
131	97
130	97
129	96
128	96
127	95
126	94
125	93
124	93
123	92
122	91
121	90
120	89
119	88
118	87
117	85
116	84
115	82
114	81
113	79
112	77
111	75
110	73
109	71
108	69
107	67
106	65
105	62
104	60
103	58
102	55
101	53
100	50
99	48
98	46
97	43
96	41
95	38
94	36
93	34
92	31
91	29
90	27
89	25
88	23
87	21
86	20
85	18
84	16
83	15
82	13
81	12
80	11
79	10
78	9
77	8
76	7
75	6
74	6
73	5
72	4
71	4
70	3
69	3
68	2
67	2
66	2
65	2
64	1
63	1
62	.9
61	.8
60	.7
59	.5
58	.5
57	.4
56	.3
55	.3
54	.2
53	.2
52	.2
51	.1

for any individual, regardless of age, without any arithmetical computation. The steps involved in this procedure are as follows:

1. In filling out the Class Record, arrange individuals in order of chronological age.
2. In the table on the edge of the Key, find the norm for each individual in turn, by first finding his age and then noting the score value (norm) which appears adjacent to it.
3. Place the scale so that this score or norm is opposite 100 in the proper column of IQ's for the individual's age. For example, the IQ for a child who is 10 years and 9 months old will be found from the first column headed "10, 11, 12."
4. Find the individual's obtained score in the scale appearing on the margin of the Key. Opposite this score in the table you will find the corresponding IQ which can then be entered on the Class Record.

Comparison of ratio and deviation IQ's. The advantages of the deviation method for obtaining a measure of brightness have already been pointed out, but perhaps a word would be helpful as to the relation between IQ's computed by the two methods. For approximately 700 students in the Portsmouth group taking Form C of the new test, both ratio and deviation IQ's have been computed. The results of this comparison are shown below:

$$r_{\text{DIQ·RIQ}} = .924$$
$$\eta_{\text{DIQ·RIQ}} = .938$$
$$\eta_{\text{RIQ·DIQ}} = .934$$
$$\sigma_{\text{DIQ}} = 17.1$$
$$\sigma_{\text{RIQ}} = 29.1$$

From these data it will be seen that the rank order of deviation and ratio IQ's is very nearly identical, but that the magnitude of the IQ's will vary in increasing amount as one moves away from the mean. Because of the close correspondence between the measures of brightness obtained by the two methods, the authors feel justified in retaining the term "IQ" for the deviation measure although it is not in truth a quotient. The reason for doing this is the widespread use of the term IQ to denote a measure of brightness rather than as an abbreviation for "intelligence quotient." Because of the greater ease of computing deviation IQ's, they are more likely to be accurate than ratio IQ's.

Percentile ranks. Percentile ranks will be infrequently used, but for the benefit of those who do have occasion to use these values, they are also given in Table 4. To find the percentile rank, it is only necessary to find the IQ and opposite it will appear the corresponding percentile rank. If it is desired to find the percentile rank corresponding to a given score without recording the IQ, this can be done by following the procedure for computing IQ's, but, without first recording the IQ's, entering the table of percentile ranks corresponding to IQ's directly. The resulting percentile rank can then be thought of as the percentile rank in terms of scores for individuals of the same age.

IX. Utilizing Terman-McNemar Test Results

Terman-McNemar test results may be used in a wide variety of ways, only a limited number of which can be described here. Since four different methods of interpreting scores have been outlined, the best procedure may be to describe the use of the test according to the method of interpretation.

Normalized standard scores. For practically all purposes the deviation IQ's are superior to standard scores. By the use of deviation IQ's the chronological age factor is partialed out in effect, making the standard deviation constant. However, if scores are to be used, the standard scores are preferable to raw scores.

Mental ages. The uses for which mental ages can be validly employed are very limited. It occasionally is of value to know that an individual's performance is at a level corresponding to the average of children older or younger than himself. For example, in deciding to promote or retard an individual, such information may be helpful. The computation of deviation IQ's, as outlined above, does not require the use of the mental age, as such, but simply requires that the norm be found corresponding to the age of the individual. Ratio method IQ's may be computed using the table of norms as a table of mental ages, but such a procedure is not recommended.

Comparison of ratio IQ's on the old and new forms of the test. IQ's on the old and new forms of the Terman test are not directly comparable because the new norms differ from the old. This results in an increase in the standard deviation of ratio IQ's on the new test. For example, in the Portsmouth population used for equating the old and new forms, the standard deviation of ratio IQ's on the old test for that half of the group taking Form A first was 12.9 points. The standard deviation of deviation IQ's for that part of the group taking the new test, Form C, first was 16.0 points. Thus IQ's on the old and new tests are not directly comparable, and the new IQ's will tend to run higher and lower than those obtained on the old test.

For the benefit of those who have used the old test, a table of corresponding scores has been provided (Table 5) to simplify the transition from the

TABLE 5

STANDARD SCORES ON TERMAN-MCNEMAR TEST OF MENTAL ABILITY CORRESPONDING TO RAW SCORES ON THE ORIGINAL TERMAN GROUP TEST OF MENTAL ABILITY AS ESTABLISHED BY EQUATING FORMS A AND C[1]

Form AorB Raw Score	Form CorD Stan. Score	Form AorB Raw Score	Form CorD Stan. Score	Form AorB Raw Score	Form CorD Stan. Score	Form AorB Raw Score	Form CorD Stan. Score	Form AorB Raw Score	Form CorD Stan. Score
0	19	40	62	80	92	120	111	160	130
1	20	41	63	81	92	121	111	161	131
2	21	42	64	82	93	122	112	162	131
3	23	43	65	83	93	123	112	163	132
4	24	44	66	84	94	124	112	164	132
5	25	45	67	85	94	125	113	165	133
6	26	46	68	86	95	126	113	166	133
7	27	47	69	87	95	127	114	167	134
8	29	48	70	88	96	128	114	168	135
9	30	49	71	89	96	129	115	169	135
10	31	50	72	90	97	130	115	170	136
11	32	51	73	91	97	131	115	171	137
12	33	52	74	92	98	132	116	172	138
13	34	53	75	93	98	133	116	173	139
14	35	54	75	94	99	134	117	174	140
15	37	55	76	95	99	135	117	175	141
16	38	56	77	96	100	136	118	176	141
17	39	57	78	97	100	137	118	177	142
18	40	58	78	98	101	138	119	178	143
19	41	59	79	99	101	139	119	179	144
20	42	60	80	100	102	140	120	180	145
21	43	61	81	101	102	141	120	181	146
22	44	62	81	102	103	142	121	182	147
23	45	63	82	103	103	143	121	183	149
24	46	64	83	104	103	144	122	184	150
25	47	65	83	105	104	145	122	185	151
26	48	66	84	106	104	146	122	186	152
27	49	67	85	107	105	147	123	187	153
28	50	68	85	108	105	148	124	188	154
29	51	69	86	109	106	149	124	189	156
30	52	70	87	110	106	150	125	190	157
31	53	71	87	111	107	151	125	191	158
32	54	72	88	112	107	152	126	192	159
33	55	73	88	113	108	153	126	193	161
34	56	74	89	114	108	154	127	194	162
35	57	75	89	115	109	155	127	195	163
36	58	76	90	116	109	156	128	196	165
37	59	77	90	117	109	157	128	197	166
38	60	78	91	118	110	158	129	198	167
39	61	79	91	119	110	159	129		

old test to the new. By means of this table a standard score on the new test corresponding to any given raw score on the old test may be found, and from this estimated standard score and the individual's chronological age, his deviation IQ according to the new norms may be determined.

[1] Since the original Forms A and B were matched for item difficulty in their construction, their comparability later checked experimentally, and since the two forms have been used interchangeably with apparent success for many years, it should be safe to assume that the standard score values in this table can be used for Form B as well as Form A of the original test. The equating of Forms C and D of the new test has already been discussed in the section on *Comparability of old and new forms.*

Deviation IQ's. Whenever a measure of brightness, as contrasted with a measure of mental level is needed, the deviation IQ serves this purpose. It assumes that brightness is normally distributed in any large, unselected population and that once a measure of brightness is determined for the individual it will remain constant provided the environment in which the individual moves also has a constant effect upon him. The uses to which IQ's may be put are many. If tests are given systematically over a range of grades, it is possible to determine fluctuations in the potentiality of an individual from one age to another. For example, such systematic determination of IQ's at successive ages will often provide a clue to causes of lowered average level of performance for an individual in comparison with average levels in previous years. The IQ may be used in sectioning classes, especially if promotion is on the basis of chronological age. It is of great value in guidance as it makes it possible to steer away from the professions and higher-level jobs those who do not have the mental capacity for them. Conversely it helps locate capable individuals who need encouragement and help in getting additional training.

Percentile rank. Only rarely will it be found necessary to resort to the use of percentile ranks in interpreting the Terman-McNemar results. Almost the only situation where this is desirable is where an attempt is to be made to compare achievement on a test for which percentile norms are supplied with the intelligence test results. Such a comparison is valid provided the group on which the achievement measure was standardized comprises a representative cross section of the total group at the given age or grade level. This will not be the case for most high school subject matter tests as there is a decided selection in the groups studying certain subjects. For example, percentile ranks on an algebra test should not be compared with percentile ranks on the Terman-McNemar test since there is a great deal of selection in the group taking algebra; the average IQ of this group is definitely above 100.

Subtest scores. No provision has been made for interpreting separate subtest scores, partly because the tests are too short, and partly because the tests comprising the battery are all essentially verbal in nature; having subtest scores, under the circumstances, would add little to our knowledge of the individuals tested.

Cumulative record. No better example can be found of the old saying that the whole is greater than the sum of the parts than the cumulative record on which the test scores for an individual are entered

and cumulated over a period of years. Such a record can reveal more about the nature of that individual and his growth processes than any single test can possibly hope to do. It is strongly urged, therefore, that the results of the Terman-McNemar test be entered on the cumulative record card. If possible, enter both standard score and IQ, and if mental ages must be entered on the record, enter standard score and IQ as well as mental age, for convenience in later reference. The careful study of these cumulative records, as the individual progresses through school, will be extremely revealing and helpful to any thoughtful teacher.

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OCCUPATIONAL INTEREST INVENTORY—Intermediate, Form A

Devised by Edwin A. Lee and Louis P. Thorpe

Name..... Sex: M—F..... Date.....

Company or School..... Position or Grade .....

City .....

1. .....

2. .....

FIELDS OF INTERESTS	Score	Percentile Rank	PERCENTILE (Chart percentile rank here) L | L-Av | H-Av | H — 1 10 20 30 40 50 60 70 80 90 99
A. P-S.			
B. Nat.			
C. Mech.			
D. Bus.			
E. Ar.			
F. Sci.			
TYPES OF INTERESTS			
1. Verb. . . . . (1)			
2. Manip. . . . . (2)			
3. Comp. . . . . (3)			
LEVEL OF INTERESTS			
a____ + d____ = ____ x 1 = ____			
b____ + e____ = ____ x 2 = ____			
c____ + f____ = ____ x 3 = ____			

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PART I.

DIRECTIONS: On this and the following pages you will find brief descriptions of kinds of work or things people do. You are to select the one of each pair that you would prefer if you had to choose one or the other. Do not consider how much you would earn, how much training would be necessary, or what people think of the activity. Assume that you must select one activity or the other even though, in some cases, you may not especially like either one or you may like both. Put a circle around the letter preceding the activity you choose.

Sample: A. Raise chickens, ducks, or turkeys and sell them.
B. Arrange a display of watches, rings, and other jewelry in a store window.

1

A Deliver groceries or meat to homes.

D[2] Wrap articles in the shipping department of a store.

2

F Work with foods, diets, and vitamins to solve nutrition problems.

A Investigate and solve crimes and lesser violations of the law.

3

E[2] Develop films or plates and print pictures.

D Address envelopes or fold letters and circulars for mailing.

4

A Call for and deliver laundry or clothing.

B[2] Grow flowers in a hot house for the market.

5

C Clean and oil small motors, vacuum cleaners, or bicycles.

D Type letters, bills, or statements for mailing.

6

C Build radio or television equipment.

E Design or construct stained glass, metal ornaments, or plastic art figures.

7

A. Show people to their seats at theaters, games, or entertainments.

C Wash and grease automobiles or trucks.

8

B Raise pedigreed dogs, horses, or other animals.

C Operate lathes, drill presses, or planers.

9

D[2] File letters, bills, or reports in an office.

E Copy signs, posters, or campaign slogans.

10

E Draw plans for homes, public buildings, or apartment houses.

A[1] Help people to solve their personal problems.

11

C Patch and replace tubes and tires on wheels.

A Carry baggage or go on errands.

12

D[3] Write letters about prices, discounts, and sales commissions.

C Operate motion picture cameras.

13

E Improve the appearance of rock gardens, shrubbery, and flower beds.

F[2] Test and repair batteries, transformers, and other electrical equipment.

14

E[1] Conduct visitors through art galleries and museums.

C Help build automobiles, ships, or airplanes.

15

D Wrap bundles or tie packages for customers in a store.

B[2] Chop wood or split kindling for fuel.

(1____ 2____ 3____)

(A____ B____ C____ D____ E____ F____)

16

D Direct the sales policies for a large store or firm.

E[1] Write stories or articles for important magazines.

17

A Make beds, sweep floors, and do other housework.

C Do odd jobs with a saw, hammer, or plane.

18

E Sketch pictures, make etchings, or do free-hand drawings for pay.

B Help with the care and protection of valuable forests.

19

E[2] Clip hedges and trim trees.

C Mix cement, or carry plaster or bricks.

20

E[2] Paint pictures of landscapes, scenes, or flowers for exhibits.

F Carry out scientific experiments with chemicals.

21

B Take care of a flower or vegetable garden.

D Carry messages or deliver packages.

22

D[1] Show salesmen how to sell goods.

A Protect the rights and property of law-abiding people.

23

F Help a scientist care for his laboratory tools and equipment.

D[2] Unpack goods, keep a storeroom in order, or arrange articles on shelves.

24

A[1] Assist customers in selecting clothing, gifts, and other articles.

C Cut patterns in wood, metal, or plastics.

25

C Repair boots, shoes, or other footwear.

E Make simple articles of leather, reed, or beads.

26

F[3] Solve problems by the use of mathematics and make graphs illustrating the findings.

D Manage a large store or group of stores.

27

D[1] Answer a business telephone, or work at a small telephone switchboard.

A Deliver newspapers, advertising circulars, or other printed matter to homes.

28

E Draw plans for garden, lawn, or highway landscaping.

C Make models of boats, airplanes, or houses.

29

D Keep receipts or other records in order.

F Collect rocks, crystals, or other earth formations.

30

F Predict weather conditions and study the causes of storms.

C Plan or make labor-saving devices or equipment.

(1____ 2____ 3____)

(A____ B____ C____ D____ E____ F____)

31

E[2] Make hook rugs or bathroom mats.

B Catch fish or hunt wild animals for profit.

32

C Make drawings with a ruler, compass, or triangle.

E Arrange stage settings, or lighting and shadow effects.

33

A[1] Sell newspapers or magazines on the street.

D Sell candy, popcorn, or peanuts for profit.

34

D[3] Devise sales agreements, price sheets, and order forms.

B Trap or raise fur-bearing animals.

35

F[2] Prepare instruments and materials for scientific experiments.

C Label bottles, pack eggs, or wrap fruit.

36

D[3] Check the accuracy of financial statements or records.

F Use scientific laws to develop new machinery.

37

B[2] Sort or pack fruit or vegetables for the market.

E Make artificial flowers, fruit, or vegetables.

38

A[1] Teach children history, arithmetic, and other school subjects.

C Repair clocks, radios, or bicycles.

39

E Finish and decorate unpainted furniture or ornamental articles.

A[2] Shine people's shoes and brush their clothes.

40

A Help sick children or other members of a family to get well.

D[1] Take charge of the selection and placement of clerks or factory workers.

41

C Wax floors, wash windows, or dust woodwork.

F Help test milk, butter, cheese, or other dairy products.

42

F Test various kinds of minerals.

E Draw cartoons, comic strips, or caricatures.

43

F Help grow and keep records concerning unusual plants or flowers.

B Pick apples, berries, or tomatoes.

44

B Raise vegetables, flowers, or other garden products for profit.

E[1] Imitate the speech of well-known characters on stage or radio.

45

A Take care of young children while their parents are absent.

E Carve wood, stone, or metal ornamental figures.

(1____ 2____ 3____)

(A____ B____ C____ D____ E____ F____)

46

E Compose or arrange music for a chorus or orchestra.

D[1] Develop new ideas for advertising and selling goods.

47

F[3] Make simple graphs, charts, and tables of numbers.

A Wait on people at a soda fountain or candy store.

48

C Repair automobile motors and ignition systems.

F. Test tooth-pastes and mouth-washes.

49

B Harvest wheat, beans, or rice.

F Remove paint or grease from wood and metal surfaces.

50

D[3] Manage the financial accounts and collections in a large company.

C Determine the strength of steel or concrete structures.

51

B Milk cows and feed and care for livestock.

A[3] Sell tickets at movie theaters, plays, or entertainments.

52

A Direct games and other activities on children's playgrounds.

E Arrange color harmonies, furniture combinations, and decorations.

53

A Keep an office tidy, run errands, and do odd jobs for an employer.

F Make face cream, soap, or tooth paste.

54

B Raise chickens, turkeys, or ducks for the market.

A Enforce health regulations and prevent the spread of disease.

55

C Operate a passenger or freight elevator.

B Herd cattle or sheep on the range.

56

B Prevent and treat diseases of horses, cattle, or hogs.

F[3] Use telescopes and mathematics to learn more about stars and planets.

57

A[2] Manicure fingernails and give shampoos.

B Destroy worms, insects, and other pests.

58

C Operate a printing press or a power sewing-machine.

B Raise cattle, sheep, or hogs for the market.

59

D[3] Keep the accounts and collect the money for a paper route.

C Assist a carpenter in building a house or a garage.

60

A[1] Work with courts and judges to help people get fair treatment.

F Analyze mineral formations.

(1____ 2____ 3____)

(A____ B____ C____ D____ E____ F____)

61

C Haul ashes, old cans, and waste paper.

B Cut down trees in a lumber camp.

62

A Coach baseball, basketball, tennis, or other sports.

F Fill medical prescriptions.

63

D Work in a store after school, weekends, or at Christmas time.

E[2] Make neckties, doilies, handkerchiefs, or tablecloths.

64

B Raise plants, bulbs, and seeds for the market.

A[1] Furnish information to travelers in a railroad station.

65

D Sell books, stationery, and other school supplies.

C Clean out offices, stores, or garages.

66

B Prevent and treat tree diseases.

F Experiment with flowers and plants to learn the laws governing their growth.

67

E Copy hand-painted Christmas or birthday cards, or party favors.

F Help to keep reports dealing with scientific observations.

68

E Design clothes, hats, or shoes.

B[2] Trim and prune trees or plants on a farm or in a nursery.

69

A Carry bags and show guests to rooms in a hotel.

E Knit scarfs, socks, or mittens.

70

D[3] Figure payrolls, salary rates, and salesmen's commissions.

E Conduct a band, orchestra, or chorus.

71

F Assist a druggist in labeling medicines, remedies, and other drugs.

E Set and shift scenery in a theatre.

72

C Paint or stain wood and metal surfaces.

D[3] Take inventories and keep records of goods in a small store.

73

F Assist in preparing dyes and cleaning fluids for use in a cleaning establishment.

E Paint and decorate drinking glasses, vases, and other glassware.

74

C Bake bread, pies, cakes, or rolls.

F[3] Measure the depth of oceans and the flow of ocean currents.

75

B Feed chickens and keep hen-coops clean.

D[3] Examine goods received to see if they agree with invoices.

(1____ 2____ 3____)

(A____ B____ C____ D____ E____ F____)

76

E Give public concerts on the piano or other instrument, or appear as a vocal soloist.

D[3] Study business trends, business costs, and methods of keeping down expenses.

77

C Help build roads or highways, or lay railroad tracks.

A Help keep passengers comfortable while traveling.

78

B Plant and care for trees, shrubs, or lawns.

E Play in an orchestra, band, or other musical organization.

79

C Do odd jobs and keep equipment in order in a store.

E Preserve flowers and shrubbery by the use of shellac or other preservatives.

80

F Develop substitutes for metal, rubber, wood, or glass.

A Help people to live better and more decent lives.

81

D Keep an office in order and do odd jobs for the "boss."

B Keep horse and cow stalls clean.

82

D[3] Keep records of production costs and overhead expenses in a factory.

F Prepare specimens on slides for study under a microscope.

83

D Buy and sell bicycles, radios, or other articles for profit.

F[3] Inspect the accuracy of scales in stores and butcher shops.

84

A Assist doctors in caring for sick or injured persons.

D[3] Make out monthly statements, balance sheets, and reports showing profit and loss.

85

E Make fancy candles or ornaments from tallow.

C Wash and iron clothes or launder shirts.

86

B Discover ways of increasing flower and plant production.

C Design and improve radios, diesel engines, or airplanes.

87

B[2] Clean and grade fruits and vegetables for the market.

C Whitewash fences, walls, sheds, or other surfaces.

88

F Check the effects of vitamins on white rats or other animals.

D[1] Sell goods to people in their homes or offices.

89

F Check the accuracy of gasoline pumps in filling stations.

D[3] Receive and check incoming supplies in a store.

90

C Improve cameras, telescopes, or microscopes.

B Plan better methods of mining gold, silver, and other valuable minerals.

91

B Cultivate beets, onions, or other vegetables.

E[2] Repair and refinish old furniture.

92

B Raise fish or frogs in private ponds for profit.

D[1] Prepare advertising circulars or business letters.

93

D Sell groceries or meats in a small-town store.

A Take orders and serve food to people in a restaurant.

94

B Manage a fish hatchery.

D Manage a shop, restaurant, or soda fountain.

95

F Maintain a constant temperature and humidity in a hot-house.

C Tighten bolts or solder wires.

96

D Direct the operation of a shipbuilding yard or oil company.

C Improve the lubrication and method of fueling of motor-driven machines.

97

E[2] Make simple vases and other objects out of clay.

B Clear land of weeds, brush, or stones.

98

A[1] Meet visitors and show people around an office or factory.

C Lay bricks or build fireplaces.

(1____ 2____ 3____)

99

E Decorate and glaze dishes, pottery, or other earthenware.

D Deliver and collect money for C.O.D. packages.

100

C Design and construct bridges, tunnels, or mountain roads.

A Direct the affairs of a college or university.

101

F Take care of animals used in testing medicines or vitamins.

C Mend broken furniture, dishes, or ornaments.

102

E[1] Teach others to sing, play an instrument, or act.

F Breed animals or insects to learn about heredity.

103

B Feed pigs and care for their pens.

F Assist in the feeding and care of thoroughbred or pedigreed animals.

104

E Make pottery, statues, or book ends.

A[1] Advise regarding travel plans and sell tickets.

105

E[2] Paint waste baskets, clothes hampers, or wooden book ends.

B Raise flowers to sell.

(A____ B____ C____ D____ E____ F____)

106

A Help to improve living conditions in cities or rural areas.

E[1] Write about the merits of concerts, radio programs, or operas.

107

A Help children to cross streets and to avoid traffic accidents.

F[3] Assist in keeping records of temperature and rainfall.

108

F Test methods for dyeing cloth and other materials.

A[2] Take temperatures and pulse rates, and make blood tests.

109

F[2] Fill bottles, paste labels, or wash test tubes.

B Know how to judge the good points of cattle, horses, or other animals.

110

C Invent tools for the manufacture of motors or other machinery.

B Develop methods of destroying pests such as worms, bugs, and other insects.

111

A Deliver milk, butter, eggs, or other dairy products.

B Produce milk and butter for the market.

112

E[1] Make announcements and take part in skits before a microphone.

F Operate x-ray machines.

113

F Sterilize dressings or medical instruments.

A Be a conductor on a street car or motor bus.

114

D Work up a small newspaper or magazine business.

F Test water or milk for impurities.

115

A Carry trays, wash dishes, or assist cooks in restaurants.

C Paint and refinish porch furniture, floors, or kitchen chairs.

116

F Prepare maps for geographies or encyclopedias.

B Develop new species of flowers or plants.

117

B Catch lobsters, shrimp, and other sea food, for the market.

A Drive a car and keep it in good condition for an employer.

118

D[2] Put labels on merchandise and place it on shelves.

B Work in a coal or other mine.

119

C Pump gasoline, fill rediators, and test batteries at a filling station.

D[3] Keep an account of the money received and spent in a small store.

120

B Develop new methods of soil conservation and flood control.

A Command a company or group of soldiers, sailors, or marines.

PART II.

DIRECTIONS: Below you will find three activities under each number. You are to choose one of the three in each grade. Indicate your choice by a circle around the letter preceding the activity.

1

b. Advise regarding travel plans and sell tickets.
c. Help people to solve their personal problems.
a. Sell tickets at movie theaters, plays, or entertainments.

2

d. Cut down trees in a lumber camp.
e. Trim and prune trees or plants on a farm or in a nursery.
c. Prevent and treat tree diseases.

3

f. Build radio or television equipment.
d. Tighten bolts or solder wires.
b. Repair clocks, radios, or bicycles.

4

a. Sell candy, popcorn, or peanuts for profit.
f. Develop new ideas for advertising and selling goods.
b. Show salesmen how to sell more goods.

5

f. Paint pictures of landscapes, scenes, or flowers for exhibits.
e. Draw plans for garden, lawn, or highway landscaping.
a. Improve the appearance of rock gardens, shrubbery, and flower beds.

6

b. Prepare specimens on slides for study under a microscope.
d. Prepare instruments and materials for scientific experiments.
f. Carry out scientific experiments with chemicals.

7

e. Direct games and other activities on children's playgrounds.
f. Teach children history, arithmetic, and other school subjects.
d. Take care of young children while their parents are absent.

8

a. Take care of a flower or vegetable garden.
b. Grow flowers in a hot house for the market.
f. Develop new species of flowers or plants.

9

c. Design and improve radios, diesel engines, or airplanes.
a. Clean and oil small motors, vacuum cleaners, or bicycles.
e. Repair automobile motors and ignition systems.

10

a. Keep the accounts and collect the money for a paper route.
c. Manage the financial accounts and collections in a large company.
e. Figure payrolls, salary rates, and salesmen's commissions.

11

f. Design or construct stained glass, metal ornaments, or plastic art figures.
b. Make pottery, statues, or book ends.
d. Carve wood, stone, or metal ornamental figures.

12

a. Make simple graphs, charts, and tables of numbers.
e. Measure the depth of oceans and the flow of ocean currents.
c. Solve difficult problems by the use of mathematics and make graphs illustrating the findings.

13

e. Take temperatures and pulse rates, and make blood tests.
c. Help sick children or other members of a family to get well.
d. Help children to cross streets and to avoid traffic accidents.

14

a. Keep horse and cow stalls clean.
e. Raise pedigreed dogs, horses, or other animals.
c. Prevent and treat diseases of horses, cattle, or hogs.

(a____ b____ c____ d____ e____ f____)

15

c. Design and construct bridges, tunnels, or mountain roads.
d. Help build roads or highways, or lay railroad tracks.
e. Lay bricks or build fireplaces.

16

d. Keep receipts or other records in order.
f. Direct the sales policies for a large store or firm.
b. Devise sales agreements, price sheets, and order forms.

17

c. Draw plans for homes, public buildings, or apartment houses.
b. Sketch pictures, make etchings, or do free-hand drawings for pay.
a. Copy signs, posters, or campaign slogans.

18

e. Test various kinds of ores.
a. Collect rocks, crystals, or other earth formations.
c. Analyze the content of mineral formations.

19

b. Furnish information to travelers in a railroad station.
f. Help to improve living conditions in cities or rural areas.
d. Help keep passengers comfortable while traveling.

20

a. Clear land of weeds, brush, or stones.
b. Help with the care and protection of valuable forests.
c. Develop new methods of soil conservation and flood control.

21

c. Invent tools for the manufacture of motors or other machinery.
d. Pump gasoline, fill radiators, and test batteries at a filling station.
b. Help build automobiles, ships, or airplanes.

22

d. Work in a store after school, weekends, or at Christmas time.
f. Direct the operation of a shipbuilding yard or oil company.
e. Manage a shop, restaurant, or soda fountain.

23

f. Write about the merits of concerts, radio programs, or operas.
e. Make announcements and take part in skits before a microphone.
d. Set and shift scenery in a theater.

24

b Test methods for dyeing cloth and other materials.
d. Make face cream, soap, or tooth paste.
c. Develop substitutes for metal, rubber, wood, or glass.

25

e. Protect the rights and property of law-abiding people.
c. Work with courts and judges to help people get fair treatment.
a. Deliver messages, go on errands, or help carry baggage.

26

a. Clean and grade fruits and vegetables for the market.
b. Raise vegetables, flowers, or other garden products for profit.
f. Discover ways of increasing flower and plant production.

27

c. Plan or make labor-saving devices or equipment.
d. Operate a passenger or freight elevator.
b. Operate a printing press or a power sewing-machine.

28

a. File letters, bills, or reports in an office.
f. Study business trends, business costs, and methods of keeping down expenses.
e. Keep records of production costs and overhead expenses in a factory.

29

f. Compose or arrange music for a chorus or orchestra.
b. Arrange color harmonies, furniture combinations, and decorations.
a. Make artificial flowers, fruit, or vegetables.

30

b. Breed animals or insects and keep records of their characteristics.
d. Help grow and keep records of unusual plants or flowers.
f. Experiment with flowers and plants to learn the laws governing their growth.

(a____ b____ c____ d____ e____ f____)

MANUAL OF DIRECTIONS

OCCUPATIONAL INTEREST INVENTORY—INTERMEDIATE SERIES

Devised by Edwin A. Lee and Louis P. Thorpe

CONTENTS

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I. Purpose of the Test

This Occupational Interest Inventory, as its title suggests, is an inventory of occupational interests and not a test of occupational abilities or skills. It is a means of discovering and using the interests of the individual as they contribute to educational and vocational guidance.

An occupation should provide much more than a livelihood; it should be interesting and congenial and produce satisfaction and pride as well as monetary rewards.

In a similar manner, the training period in the Secondary or Vocational School should be stimulating and challenging because it is properly related to the individual's occupational interests.

Past neglect in discovering occupational interests as one basis for counselling and guidance in the schools, and for selection and placement in business and industry, has resulted in the training and induction of thousands into callings for which they possessed the requisite abilities and skills but in which they lacked or failed to develop abiding interests. Other thousands have, in similar fashion, drifted into jobs or have obtained employment on the basis of mere expediency.

This ignoring of occupational interests should be avoided. It leads to careless and indifferent work during training, and produces careless, indifferent, and inefficient workers. The employer loses in quality and quantity of production; and the employee often becomes restless, dissatisfied, and disposed to make trouble.

The major purpose of this Inventory is to aid in discovering the basic occupational interests possessed by an individual in order that he may become or remain an interestetd, well-adjusted, and effective student as well as a profitable employee. Once this discovery has been made, a number of specific and often related callings are usually disclosed to the individual for his consideration. The choice of a particular vocation may then be approached on the basis of such factors as his personality qualities, his skills, his health, and existing opportunities for training and employment.

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II. Structure of the Inventory

Among the structural features of this Inventory are the following:

1. **Fields of Interest.** An interpretation of Inventory findings first identifies the individual's occupational interests within six major fields: A. Personal-Social; B. Natural; C. Mechanical; D. Business; E. the Arts; and F. the Sciences. Occupational interests vary in scope from a specific part of one of these six fields to a variety of interests in two or more fields. For example, interests in the mechanical field may be accompanied by similar interests in science and thus reveal a potential inventor, mechanical engineer, or machinist. A combination of interests in the natural and the arts fields may reveal a potential landscape artist.
2. **Types of Interests.** This Inventory also reveals certain types of interests which the individual possesses. The objective of this feature is to determine whether the individual is most interested in (No. 1) verbal activities which involve facility in the use of language, in (No. 2) manipulative activities in which he works with materials, or in (No. 3) activities which require computational ability and skill. This unique feature should make possible more exact counseling and guidance in the schools and more accurate selection and placement in the world of work.
3. **Level of Interests.** This Inventory also identifies the levels on which an individual's basic interests exist. The results indicate whether these interests are associated with routine tasks, with tasks requiring considerable skill, or with tasks requiring expert knowledge, skill, and judgment and which often involve supervisory and administrative activities.

The authors believe these to be important features, both for guiding the preparation and training of potential workers and for selection and placement in industry.

III. Special Features

1. **Administration.** The inventory is easy to administer. Instructions are brief and nontechnical and may readily be understood. Administration does not require that the examiner be trained in measurement techniques. The total time required is 30-40 minutes.
2. **Scoring.** Because the fields as well as levels of interests are identified by letter and the types of interests by numbers attached to letters, the inventory may be quickly and easily scored by counting responses. Full directions for scoring are given on page 4.
3. **Interpretation.** Special tables and aids are provided to make the inventory results most meaningful and helpful.

IV. The Nature and Scope of the Inventory

Since a given individual may be interested in any one of many thousands of occupations, it would appear illogical and fruitless to attempt to identify a single best occupation for an individual as the result of reactions to only two or three hundred inventory items. Furthermore, it is questionable whether such identification should be attempted; important factors other than interests, significant as they are, should enter into the choice of an occupation, and type of training.

There are other reasons for avoiding the attempt to select the one best occupation on the basis of interests. Interests are associated primarily with certain types of activities, not with occupations as such; and many of these activities are associated with several different occupations. It would appear logical, therefore, to identify fields of interest in conformity with the above facts as a point of departure in using interests in the selection of occupations and training. This plan has been followed in the development of this Inventory.

The authors claim no special superiority for their classification of interest fields. Any classification system is primarily an administrative device useful in constructing and interpreting a test or inventory. So long as the principles underlying a classification are understood, the instrument may be useful. The six categories used in the present Inventory were selected because they appeared best to fit the socio-economic situation and to contribute most satisfactorily to their objectives in devising this Inventory.

There are forty items in each of the six major interest fields. Twenty of these have been selected as low, 12 as medium, and 8 as high. These signify, in general, interests which are routine, on the skilled, or on the expert, supervisory, and administrative levels. This classification was based primarily upon the ratings given in the "Dictionary of Occupational Titles" to the occupations with which each of these items was associated.[1] When the Dictionary contained no helpful information, items were analyzed and rated on the basis of their significance in the occupations with which they were associated. The purpose of this classification was to make a more valid pairing of items possible; thus lows are paired with lows, mediums with mediums, and highs with highs. This arrangement aids in making the interest appeal of any given item itself, rather than its level, the deciding factor in each choice.

However, this division of items into three interest levels still leaves a considerable interest range on each level. Furthermore, no group of activities is probably the exact equivalent of any other group so far as interest level is concerned. For this reason, valid pairings sometimes have the appearance of inequality when in reality they are located on the same relative interest level.

(Continued on page 4)

[1] Issued by U. S. Department of Labor, Employment Service. For sale by Supt. of Documents, Washington, D. C.

DESCRIPTION OF THE FIELDS, TYPES, AND LEVEL OF INTERESTS

FIELDS OF INTERESTS

A. Personal-Social—The Personal-Social field includes interests which involve primarily association with or service to individuals or groups of individuals. These interests involve advice, service, physical care, or personal attention as exemplified by domestic service (e.g., items 1, 27, 47, 93, 117), law and law enforcement (e.g., items 2, 22, 60, 107, 120), social service (e.g., items 10, 80, 104, 106), teaching (e.g., items 38, 52, 62, 100, 102), and health and medical service (e.g., items 40, 44, 84, 108).

B. Natural—The Natural field includes agriculture and work related to utilization and protection of natural resources. It involves such activities as the raising of cattle, poultry, crops, and food products, the extraction of minerals, the care of forests, and fishing. Typical fields of interest sampled include lumbering and forestry (items 15, 18, 61, 66), gardening and greenhouse care (items 4, 2, 44, 78, 116) control of wild life (items 31, 34, 92, 94, 117), and general farming (items 37, 43, 57, 75, 103).

C. Mechanical—The Mechanical field has to do with activities such as processing, manufacturing, building, constructing, and repairing. It includes interests in mechanical apparatus and labor-saving machinery. Important mechanical interests sampled include designing (items 28, 30, 32, 36, 100), machine operation (items 5, 8, 55, 58), construction work (items 14, 19, 59, 100), and repairing (items 11, 17, 38, 79, 101).

D. Business—The Business field involves interests in selling, management, finance, and distributive activities. It includes office and secretarial work as well as banking and investment interests. Typical fields sampled in the Inventory include selling and buying (items 16, 33, 46, 65, 73), bookkeeping and stenography (items 3, 12, 29, 59, 119), shipping and distribution (items 1, 21, 23, 75, 99), and management and supervision (items 16, 22, 26, 50, 94).

E. The Arts—The Arts field refers to interests in music, dramatic production, literary activities, the skills involved in self-expression through drawing, painting, and other activities involving line, color, and sound. Outstanding interest areas sampled in the Inventory include painting and drawing (items 9, 18, 42, 73, 105), drama and radio (items 32, 44, 71, 106, 112), decorating and landscaping (items 13, 19, 28, 52, 73), and musical performance (items 46, 70, 76, 78).

F. The Sciences—The Science field of interests include activities related to research, experimentation, invention, the determination of cause and effect relationships, and controlled observation. Among the science interest catagories sampled in the Inventory are chemical research (items 20, 41, 53, 73, 114), mineral and petroleum production problems (items 29, 42, 60, 99), plant and animal breeding, (items 43, 66, 95, 102, 103), and scientific experimentation (items 35, 76, 67, 88, 101).

TYPES OF INTERESTS

Verbal—An interest is said to be verbal when it involves the giving of instructions, when conversations or forms of persuasion are entailed, or when services are rendered largely through the avenues of speech or writing. This type of interest is exemplified in sales promotion, management, supervision, writing, lecturing, teaching, and dramatic activities.

Manipulative—Manipulative interests are those requiring work principally with the hands or feet, and in connection with which materials are handled by mechanical means. It is exemplified in shipping activites, handcrafts, drawing, painting, typing, machine operation, repairing, nursing, and surgery.

Computational—An interest is computational when it involves numerical calculationss or the extensive use of numbers. Computational activities are utilized extensively in business and in the sciences, and to a lesser degree in the other occupational fields. This type of interest is exemplified in bookkeeping, accounting, investment, scientific research, and in all phases of engineering.

LEVEL OF INTERESTS

Level of Interests—Interest levels vary from those which require simple, routine, and unskilled activity to those which involve originality, inventiveness, careful planning, and professional skill. By means of thirty situations, in each of which associated activities are presented on three levels (low, medium, and high), the individual reveals by his choices whether his preferences are consistently low, medium, or high and gives a clue to the level of occupations to which he might be guided.

The authors believe that the identification of types of occupational interests will prove a very helpful innovation. As already indicated, three such types are identified by the present inventory; verbal, manipulative, and computational. Certain other interests are also associated with the items of the inventory, but they do not appear to occur in sufficient numbers to constitute types in the same sense as the three mentioned above.

For a further elaboration of factors related to validity, see Section VIII *of this Manual.*

V. Directions for Administering the Hand Scored Edition[1]

1. Have all examinees write identifying data on the first three lines. Additional lines are provided for special information, if desired.
2. When all have completed No. 1 above, have booklet opened to page 2. Read aloud the directions which precede Part I, page 2. Say: **If you prefer to raise chickens, ducks, or turkeys and sell them, you would put a circle around A; if you prefer to arrange a display of watches, rings, and other jewelry in a store window you would put a circle around B.**
3. Answer any questions which arise in interpreting the directions. Be sure that the examinees understand these directions.
4. Say: **Now do the other pairs in Part I the same way. When you reach Part II read the directions and complete the Inventory.**
5. The Inventory can ordinarily be completed in 30-40 minutes. Examinees should be permitted to complete all items.

VI. Directions for Hand Scoring[1]

A. **Locating Interest Fields.**

1. Each letter identifies an interest field. Count and enter at the bottom of each page, in the blanks provided, the number of "A's," "B's," "C's," "D's," "E's" and "F's" that were circled by the examinee. (Ignore the numbers attached to certain letters for scoring.)
2. Add all the "A" scores for Part I. Transfer this total to the score blank provided to the right of "A" on page 1 of the Inventory.
3. Add the page scores for other letters and enter the totals on page 1 in the same manner.
4. Determine the percentile rank for each by reference to page 8.
5. Mark each of these percentile ranks on the lines to the right in the percentile chart, placing an "X" at the proper point in each case. (See Illustration on page 7.)

B. **Types of Interests.**

1. Each number attached to a letter identifies a type of interest: "1" identifies a verbal interest; "2" a manipulative interest; and "3" a computational interest.
2. Count the number of "1's," "2's," and "3's," circled on each page and enter these sums at the bottom of each page in the blanks provided.
3. Add the entries at the bottom of each page to obtain the total number of "1's," "2's," and "3's" circled in Part I of the test.
4. Enter these totals in the blanks provided on page 1 of the Inventory.
5. Convert these sums into percentile ranks by reference to page 8.
6. Mark these percentile ranks on the lines to the right in the percentile chart, by placing an "X" at the proper point in each case.

C. **Level of Interests** (Page II).

1. Each small letter identifies a level of interest. Count the number of times each letter has been circled and enter these sums on the proper blank provided at the bottom of each page.
2. Add the entries for each letter for the whole of Part II of the Inventory. Enter these totals on page 1 of the Inventory in the spaces provided.
3. Add "a's" and "d's," "b's" and "e's," and "c's and "f's" as indicated. Enter totals on the score blank provided on the right.
4. Multiply the sum of "a's" and "d's" circled by 1; the sum of "b's" and "e's" circled by 2; and the sum of "c's" and "f's" circled by 3. Add these products and place this sum on the score blank to the right.
5. Convert this total to percentile rank by reference to page 8.
6. Mark this percentile rank on the line to the right in the percentile chart by placing an "X" at the proper point.

D. **Occupational Interests Profile.**

1. Connect all "X's" with a heavy line. (See Illustration on page 7.)
2. This line constitutes the individual's occupational interests profile.

VII. Reliability

The reliability of the Inventory has been determined by a repetition of the test to 100 ninth-grade students, the number of boys and girls being approximately equal. The re-tests were given after an interval of four weeks to a group of pupils who had not seen the results of the first Inventory. Preliminary calculations indicate that the reliabilities will vary from .80 to .92 for the various categories.

[1] These instructions should be modified appropriately when the machine scored edition is used.

Reliabilities will be forwarded under separate cover.

VIII. Validity

There are no purely objective criteria for establishing the validity of an occupational interests inventory. The halo effects associated with occupational titles often play havoc with intercorrelations among them. As a result, what appears to be a genuine interest (but based upon an inadequate knowledge of the specific activities involved in a given occupation) often evaporates when the tasks, activities, advantages, and limitations of the occupation are understood. Even reactions to activities themselves do not entirely escape these disturbing influences.

However, certain factors may aid or detract from the validity of occupational inventories, depending upon how they are utilized in developing such instruments. Among these factors are the following:

1. The selection of items.
2. The design or description of items.
3. The balance of the items constituting the test or inventory.
4. The presentation of items.

In developing this Occupational Interest Inventory the following methods were used:

1. **Item Selection.** The Dictionary of Occupational Titles served as the source of practically all items used in this Inventory. This publication, known as the "bible" of job descriptions, is the most authoritative source of activities associated with occupations now in existence. This source was supplemented in a few cases with carefully chosen descriptive activities which were not contained in the Dictionary.

The above Dictionary describes activities involved in many thousands of occupations. An inventory can be but a sampling of these. The authors have attempted to describe and present activities which are representative of the total range of occupations.

2. **The Design or Description of Items.** This Inventory attempts to avoid reactions to occupations, as such, in order to avoid the disturbing "halo" effects previously mentioned. Many examinees might, for example, manifest an apparently genuine occupational interest in response to "physician or surgeon," yet react very differently when "answering calls during the night" or "suffering" or "blood" are involved in the description of activities. It is therefore probable that favorable reactions are stimulated by the prestige and security usually associated with the medical profession, without regard for other and more important aspects

In this Inventory the individual is requested to react to **groups** or **constellations** of **activities** which are associated with various occupations. This procedure has been used in an attempt to identify occupational interests more accurately.

3. **The Balance of Items.** This Inventory presents 240 groups of activities associated with six major interest fields, 40 of them in each major field. The 40 choices in each field have been selected to fall into three levels: low, medium, and high. Thus "washing dishes" or "making beds" is on the low level in the Personal-Social field; playing an instrument in a band or orchestra is on the medium level in the Arts field; and designing specialized machinery is on the high level in the Mechanical field.

In matching these interest items in Part I of this Inventory, lows are associated with lows; mediums with mediums, and highs with highs. This arrangement aids in avoiding the disturbing influences which might result from crossing occupational levels; viz, matching a low interest in one field with a high interest in another, such as a choice between dish-washing and managing a bank.

A further safeguard to the balance of items results from the matching relations between major fields. Of the 40 choices in each major field, 8 of each of these choices are matched with 8 choices in each of the other fields. This results in a completely balanced sampling of responses.

4. **The Presentation of Items.** The authors have chosen the paired-choice method of presenting items to the examinees. When items are presented singly, it is often difficult for the individual to decide whether he likes, dislikes, or is neutral regard-

ing a given choice; these terms are somewhat vague and provide no point of reference for comparison. On the other hand, when two groups of activities are presented in contrast, the situation becomes more concrete and meaningful and contributes to a more accurate choice. Research appears to confirm the superior stability of choices made in this manner.

The above method also requires the individual to choose between two groups of activities even though he is interested in neither or both. The repetition of samplings and the method of scoring them identify the choices which survive as the individual's strongest occupational interests.

Identification of types of interests, already described in Section II of this Manual, is based upon the obvious nature of the activities themselves. The level of interests, also previously described, is identified in Part II of the inventory by contrasting three levels of activities in a single interest field.

The authors have proceeded on the assumption that the purpose of an occupational interest inventory is to identify as accurately as possible the occupational fields in which an individual would be most happy and effective, and that the choice of a specific occupation should then be approached in the light of such conditioning factors as the individual's personality, abilities, health, and opportunities for training and employment. They believe that these conditioning factors are more fundamental and significant than the attempt to select occupations by statistical determinations of relations between interests in occupations as such.

IX. Using the Results of the Inventory

The Inventory provides a record of the preferences of examinees in six fields of interest and also with reference to three types of interests and level of interests. In the experimental use of this Inventory it was found that there are significant differences in the number and types of items selected by girls and women as compared with boys and men.

These data are illustrated by the medians obtained in several hundred ninth grade high school students which are classified by sex in the following table:

	GIRLS	BOYS
A. Personal-Social	24.4	17.8
B. Natural	14.3	21.6
C. Mechanical	13.7	23.6
D. Business	26.6	18.8
E. The Arts	24.1	17.0
F. The Sciences	18.6	23.6
1. Verbal	13.0	8.7
2. Manipulative	13.3	11.8
3. Computational	11.7	8.6
Level of Int.	60.9	64.8
No. of cases	355	402

The foregoing table reveals that the girls have higher averages in Personal-Social, Business, and the Arts, while the boys score higher in the Natural, Mechanical, and the Sciences fields. The girls show considerably greater preference for Verbal types of activities than do boys and are slightly higher than boys in both Manipulative and Computational selections. In the Level of Interests section of the Inventory the median for boys is slightly higher than that for girls, indicating that boys tend to select somewhat more involved or complicated activities.

An inspection of the percentile norms appearing on page 8 of this Manual will bear out the foregoing findings. However, there are wide differences in the choices of individual boys and girls, as is also shown by the distribution of scores in the percentile norms.

In order to make an appropriate interpretation of data, separate norms have been established for males and females and for the composite population.

In the interpretation of data for a given individual it is recommended that the norms for the appropriate sex be used unless the principal objective is to determine interest irrespective of sex.

The sample profile of a typical case is presented to illustrate the methods of recording and charting data obtained by the Inventory. Following this illustration is a brief presentation of the data with interpretations which should normally be made.

It will be noted that the interpretations and inferences are those which are obviously derived from the instrument. As stated above, it is the belief of the authors of this Occupational Interest Inventory that it should always be supplemented by personal data and information regarding the individuals mental maturity, personality, special aptitudes and abilities, physical condition, and educational background.

A suggested plan for the use of this Occupational Interest Inventory as part of a comprehensive guidance program will be furnished upon request.

X.* Percentile Norms

The percentile norms[1] provided on page 8 of this Manual are of three types: (1) for males, (2) for females, and (3) for the composite population. It is suggested that the separate sex norms be used when it is desired to compare a given individual's interests with those of his or her own sex. This procedure would ordinarily be followed in individual counseling and in general educational and vocational guidance. When the Inventory is being used for selection and placement of employees in business and industry, the "composite population" norms should ordinarily be used.

On occasion it may be desirable to record and

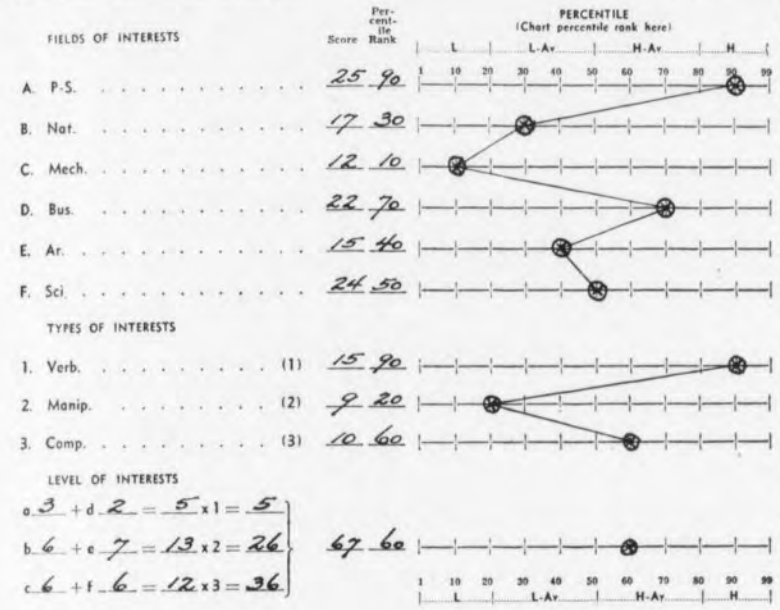
[1]A percentile may be described as a point on a 100 point scale which gives the per cent of scores which fall below that particular percentile. For example, an individual whose score falls at the 30 percentile point exceeds 30 per cent of the population on whom the test was standardized; also, such a score may be interpreted to mean that this person is lower than 70 per cent of the other individuals in the standardization group.

chart both the appropriate "sex" and the "composite population" percentile ranks, using a different colored pencil to aid in delineating the relationships.

The percentile norms presented in this Manual were obtained from over one thousand Inventories given to 9th grade students in a number of California secondary schools. The norms are suitable not only for high school students but also for the general adult population, especially those who lack technical or professional training. This is particularly true because the instrument requires a comparison and choice between 120 pairs of activities. Thus, the distribution of choices rather than the total score provides the significant data.

JACK SMITH
WASHINGTON HIGH SCHOOL

MALE
GRADE 9



This illustration presents the Inventory data for a ninth-grade boy and shows that his major interest is in the Personal-Social field. His second highest interest is Business and the two lowest are in the Mechanical and Natural fields. In types of interests his choices are high in the Verbal and he appears to avoid choices requiring Manipulative activity. His level of interests indicates a preference for activities of moderate difficulty.

We should expect that he would be more interested and successful in vocations which involve association with people particularly where the use of language is required. He would undoubtedly be interested in training for business or commercial activity of moderate complexity where the above mentioned factors are pertinent.

An adequate interpretation in this, as in all instances, requires that Occupational Interest Inventory data be supplemented by information regarding mental maturity, physical condition, personality, special aptitudes and abilities, and educational background.

SEPTEMBER, 1943

Competent Typist Test

Use double spacing in typing this ten-minute test

(To find the gross number of words you write, divide gross number of strokes by 5; then deduct ten words for each error to get net words written. Divide this by 10 to determine the net words per minute. The number of strokes is indicated at the end of each line in order to facilitate counting the gross number of strokes written.)

	Strokes
I do not know the man's name. No one knows who he is.	56
No one will ever know his name. Yet he is the man who	111
has done more than any other single individual to hold	166
mankind together in some form of social fabric. His identity	228
is lost among the dim early pages of human history. He	284
probably lived somewhere in southeastern Europe—when	338
the more-or-less human race was a pitifully primitive and	396
aboriginal people.	416
Life was cruel in those days, ten thousand years ago. It	474
consisted of not much more than a never-ceasing movement	531
—a pause for a little while here, and then a desperate mi-	589
gration to there. Why? Because life was primarily a search	650
for food. Food consisted sparsely of the occasional flesh of	712
those wild beasts that could be slain with primitive weapons;	774
but more importantly food consisted of the grains, the	829
fruits, the vegetables that might luckily be found growing.	890
Found growing, you say? Yes, because primitive man had	946
no idea of agriculture. Homeless and helpless, he wandered	1006
with his family until he found some food. Then he ate it.	1066
Then he just moved wearily on until he found more food.	1123
Each of these pathetic groups of humanity was ruled by	1178
an absolute monarch, often referred to as the old man of	1235
the tribe. When the old man died, these people thought that	1296
perhaps the ruler had merely gone on a journey. So they	1353
carefully buried him to protect his body from wild animals.	1414
Lest the old man should feel neglected, they hastened to	1471
bury with him some food for his journey, and this usually	1529
consisted of grain. If, by chance, once out of a thousand	1588
times some of this buried grain grew up through the ground	1647
again these primitive people gratefully believed that the	1705

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Strokes

One day back there in the good old days when I was nine 56
and life was still a delightful and mysterious dream, my 113
cousin, who was considered crazy by everybody who knew 168
him except me, came to my house at four in the morning 223
and woke me up by tapping on the window of my room. I 278
jumped out of bed and looked out of the window. 327

It wasn't morning yet, but with daybreak not many 377
minutes around the corner it was light enough for me to 433
know I was not dreaming. My cousin was sitting on a 486
beautiful white horse. I stuck my head out of the window 544
and rubbed my eyes. Yes, he said to me in Armenian, it is 603
a horse. Make it quick if you want to ride. 649

I knew my cousin enjoyed being alive more than any- 699
body else who had ever fallen into the world by mistake, 756
but this was more than even I could believe. In the first 815
place, my earliest memories had been memories of horses 871
and my first longings had been longings to ride. 921

We were poor. Our whole tribe was poverty-stricken. 975
Every branch of the family was living in the most amazing 1033
and comical poverty in the world. Nobody could under- 1086
stand where we ever got money enough to keep us with 1139
food, not even the old men of the family. Most important 1197
of all, though, we were famous for our honesty. We had 1253
been famous for our honesty for something like eleven cen- 1310
turies, even when we had been the wealthiest family in what 1370
we like to think was the world. We were proud first, honest 1431
next, and after that we believed in right and wrong. None 1490
of us would take advantage of anybody in the world, let 1546
alone steal. 1560

Consequently, even though I could see the horse, I 1611
couldn't believe the horse had anything to do with my cousin 1672

or with me, or with any of the other members of our family, asleep or awake, because I knew my cousin could not have bought the horse, and if he could not have bought it he must have stolen it, and I refused to believe he had stolen it. No member of the family could be a thief. 1732 1789 1845 1905 1953

I stared first at my cousin and then at the horse. There was a pious stillness and humor in each of them which on the one hand delighted me and on the other frightened me. Well, it seemed to me stealing a horse for a ride was not the same thing as stealing something else, such as money. If you were crazy about horses the way my cousin and I were, it was not stealing. It would not become stealing until we offered to sell the horse, which of course I knew we would never do. 2011 2068 2127 2185 2244 2299 2356 2415 2435

I jumped down to the yard from the window and leaped up onto the horse behind my cousin. That year we lived at the edge of town, and behind our house was the country. In less than three minutes we were on the highway, and then the horse began to trot. The air was new and lovely to breathe. The feel of the horse running was wonderful, and my cousin began to sing. We rode and my cousin sang. For all anybody knew we were still in the old country where, at least according to some of our neighbors, we belonged. 2488 2547 2607 2664 2720 2779 2838 2898 2954

We let the horse run as long as it felt like running. At last my cousin made me get down so that he could ride alone. All right, I said, you have got to let me try to ride alone. I got down and my cousin kicked his heels into the horse and shouted. The horse stood on its hind legs, snorted, and burst into a fury of speed that was the loveliest thing I have ever seen. My cousin raced the horse across a field of dry grass to an irrigation ditch, crossed the ditch on the horse, and five minutes later returned, dripping wet. I leaped to the back of the horse and for a moment knew the awfulest fear imaginable. The horse did not move.—*Adapted from "My Name Is Aram," by William Saroyan* 3012 3066 3128 3187 3250 3310 3370 3432 3489 3547 3597

Competent Typist Test

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(To find the gross number of words you write, divide gross number of strokes by 5; then deduct ten words for each error to get net words written. Divide this by 10 to determine the net words per minute. The number of strokes is indicated at the end of each line in order to facilitate counting the gross number of strokes written.)

	Strokes
After a certain letter came to me the year I was twelve,	57
I made up my mind to become the most powerful man in	110
my neighborhood. I had clipped a coupon from a magazine,	168
signed it, placed it in an envelope and mailed it. The recipi-	230
ent had written back promptly, with an enthusiasm border-	286
ing upon pure delight, saying I was undoubtedly a man of	343
uncommon intelligence, potentially a giant and unlike the	401
average run-of-the-mill people of the world who were, in	458
a manner speaking, dream walkers and daydreamers. I was	515
a person who would some day be somebody. His opinion of	572
me was very much like my own. It was pleasant, however,	629
to have the opinion so emphatically corroborated, particu-	686
larly by a man in New York—and a man with the great-	738
est chest expansion in the world. With the letter came	794
several photographic reproductions of the writer. He was	852
a tremendous man and claimed at one time that he had	905
been puny. He was loaded all over with muscle, and ap-	959
peared to be somebody who could lift a roadster and tip	1015
it over. It was an honor to have him for my friend.	1069
The only trouble was I didn't have the money. I forget	1125
how much the exact figure was at the beginning of our	1179
acquaintance, but I have not forgotten that it was an	1233
amount completely out of the question. I did not seem to	1291
be able to find words with which to explain about not hav-	1348
ing the money, without appearing to be a dream walker	1402
or a daydreamer myself. So, while waiting from one day	1458
to another, looking everywhere for words that would not	1514
degrade me to commonness, I talked the matter over with	1570
my uncle, who was studying oriental philosophy at the	1624
time. He said the secret of greatness, according to Yoga,	1683
was the releasing within oneself of all those mysterious	1740

Strokes

vital forces which are in all men. I told him I could not 1799
begin to become the powerful man I had decided to be- 1851
come until I sent the money. Although my uncle was not a 1907
puny man, he was certainly not the man my friend was, 1963
but it seemed to me that, at best, my new friend would 2018
have a great deal of trouble in a match with my uncle. 2074

Long before I had discovered words with which to ex- 2125
plain about the money another letter came. It was as 2179
cordial as the first and if anything a little more cordial. I 2242
was delighted and ran about releasing mysterious vital 2297
forces, turning handsprings, scrambling up trees, and try- 2354
ing to tip over a 1920 Ford, and in many other ways 2406
alarming my relatives and irritating the neighbors. Not 2463
only was that man not sore at me, but he had reduced the 2520
cost of the course. Even so, the money necessary was still 2580
more than I could get hold of. I was selling papers every 2639
day, but that money was for bread, and stuff like that. 2696
For a while I got up early every morning and went around 2753
looking for a small satchel full of money. During six days 2813
of this adventuring I found a nickel and two pennies, and 2871
I also found a woman's purse containing several foul-smell- 2929
ing cosmetic items, no money, and a slip of paper. Three 2987
days after the arrival of the second letter a third letter 3046
came. From this time on our correspondence became one- 3101
sided. In fact, I did not write at all. 3143

The letters continued to arrive every two or three days 3199
all winter and on until springtime. I remember the day 3255
apricots were ripe enough to steal, the arrival of a most 3313
charming letter from my friend. It was a hymn to new- 3366
ness on earth, the arrival of springtime, the time of youth 3426
in the heart, and many other things. It was truly a beau- 3483
tiful epistle — and he said he could teach me everything in 3542
one fell swoop, or one sweep fall, or something of that sort, 3604
for only three dollars.—*Adapted from "My Name Is Aram," by* 3627
William Saroyan